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Dropping Some of the Pilots

IT must be as hard for the R.A.F. to part with at least some of its aeroplanes as it was for the great cavalry regiments to part with their horses; for with its aircraft the R.A.F. has won splendid victories and in only one generation has built up a great tradition. But the parting is proving a graceful one; and the R.A.F.'s sensible attitude towards the advent of guided weapons, and their repercussions on the Service, was clearly shown in views expressed by some of its senior spokesmen—who are personally responsible for the changes—when they answered questions at an Air Ministry conference last week. This attitude to guided weapons was clearly defined in the statement that these were regarded as "a natural step" in the growth of air power; in the succinct remark that in its new development the R.A.F. is "merely leaving out the pilot in certain rôles"; and in the clear recognition that the R.A.F. will go on using manned aircraft for a long time to come—in fact even more than ever before in the all-important work of transport.

But most revealing of the R.A.F. official attitude were the answers given to questions put by journalists at the end of the conference. These made it clear that the guided-missile stations—at North Coates and elsewhere—will not differ in their administrative structure of wings, squadrons and flights from any other R.A.F. stations; that there is not to be a badge to distinguish guided missile personnel from other members of the R.A.F.; and that the names of R.A.F. Commands will not be altered.

The clear inference is that the R.A.F. is determined not to lose its identity and integrity under the impact of guided-missile operations, but rather to phase-in the new weapons to its existing framework. As one of the spokesmen put it (with no little touch of pride), the R.A.F. is still young and flexible enough to withstand such changes. Which is as it should be. Clearly, the R.A.F. intends to continue ruling Britain's skies in its own way—even if, ultimately, from the ground.

Accolade for Radar

THE designers of "black boxes" are still often regarded as rather dangerous wizards and disturbers of the slide-rulers' peace. Too often are they relegated to small back rooms and their work shrouded in the numbing anonymity of secrecy. It is therefore particularly welcome and well-deserved that the Radar Research Establishment at Malvern should, on the occasion of the Queen's visit last week, have been renamed the Royal Radar Research Establishment. Such recognition has been accorded to few comparable establishments.

The R.R.R.E., as it will henceforth be known, was formed in 1953 by the amalgamation of the Telecommunications Research Establishment, which grew out of Sir Robert Watson Watt's team of 1935, and the Radar Research and Development Establishment, which originated from a Royal Engineers experimental section engaged in searchlight development in 1917. Among the great wartime achievements of these units are the early-warning radar system, A.I. gear, A.S.V. search radar, Gee, Oboe, H2S, radar for guns and searchlights, coastal defence radars and the radio proximity fuze.

All this knowledge was applied, after World War 2, to further developments, both military and civil, which have resulted in equipment now used in air traffic control, storm detection, air survey and meteorology. Much of the work is secret, but a giant radar capable of detecting small aircraft several hundred miles away, and the very important Doppler radars, can be mentioned. Semiconductors for both valve and photosensitive applications, computers, and simulators for missile and other work are being studied; and the Establishment runs the College of Electronics.

This work has always been closely co-ordinated with that of the radio industry so that development and production resources have been effectively used. One factor of which both the Establishment and the industry may be proud is that the radar support required for Britain's air defence is not in any way lagging behind the weapons which provide the executive power of that defence system.

FROM ALL QUARTERS

Royal Radar Visit

WHEN the Queen and the Duke of Edinburgh visited the Radar Research Establishment at Malvern on April 24 during their tour of the Midlands, it was announced that Her Majesty had been graciously pleased to command that henceforth the establishment should be known as The Royal Radar Establishment.

At the establishment the Queen and the Duke, who were accompanied by the Minister of Supply, Mr. Aubrey Jones, inspected workshops before going on to the south site three miles away where, under strict security precautions, they saw guided-weapon equipment and airborne radar equipment demonstrated.

[Reference to the R.R.E.'s new honour, and to its history, is made in a leading article in this issue.]

Maurice Wright

WITH deep regret we record the death, at Stanmore, Middlesex, on April 27, of Major M. E. A. Wright, A.F.C., B.A., F.R.Ae.S., a director of the Fairey Aviation Co., Ltd. He was one of the best-liked figures in the industry, and his career—as a pilot and later as an executive—was exemplary.

Major Wright.

Maurice Wright was born in 1893 and was educated at Marlborough and Caius College, Cambridge. Shortly before the First World War, as an air-minded undergraduate, he frequented Eastchurch, Isle of Sheppey, where he met the late Sir Richard Fairey (Dick Fairey, as he was at the time). A friendship began which was to last for more than forty years. In 1914 Maurice Wright volunteered for the Royal Naval Air Service and flew throughout the war on operations in the North Sea, the Dardanelles, Bulgaria, Syria, Aden and Egypt. After transferring to the R.A.F. in 1918 he became an Air Ministry test pilot, and in 1924, with long experience of seaplanes and flying-boats, he joined the Marine Aircraft Experimental Establishment at Felixstowe as chief technical officer. In 1925 Dick Fairey, who had formed his own company in 1915, invited Maurice Wright to join the Fairey Aviation Company as a director. In his thirty-two years with the company the latter flew a great number of different Fairey aircraft—the last as recently as 1948—bringing his total of types flown to more than 170.

He was chairman of Avions Fairey and a member of the Council of the Society of British Aircraft Constructors.

Major Wright leaves a widow and a son and daughter. General sympathy will be extended to them—as, indeed, it will to the Fairey company: this is the third grievous loss they have suffered within seven months, for the death of Sir Richard Fairey occurred on September 30 last year, to be followed on February 9 by that of his successor to the chairmanship, Mr. R. T. Outen.

Swedish Hunters

WHILE confirming Stockholm reports that the Swedish Air Force had grounded its Hunters, a Hawker Siddeley group spokesman last weekend denied that ten accidents had occurred. He said: "Sweden has been operating Hunters for eighteen months. In that time there have been five Hunter crashes, four of them since January. These were from different causes. The aircraft have been grounded for investigation."

Rolls-Royce Future

IN comments on the effect of the Government's new defence policy on Rolls-Royce, Ltd., published in the works magazine, Mr. J. D. Pearson (deputy chairman) says that it "alters the whole character of the military aero-engine business in this country," and he adds: "While we have tried to anticipate these changes and have taken what we consider to be the necessary steps to meet them, we will not know how successful we have been until more details are available.

"While we are fortunate that our engines are in at least two of the three V-bombers and in the English Electric P.1 fighter, our main hopes for the future of the aero-engine division must rest on the civil side."

New U.S. Transport

USING the appellation Turboboxcar, Fairchild are developing a completely new short-field military and civil transport powered by four 1,600 h.p. Lycoming T55 turbines (the engine specified for the rather similar Douglas 1906 and 1940).

Employing boundary-layer control, the high-wing Turboboxcar will weigh 75,000 lb, cruise at 216 kt and lift 32,181 lb for short hauls and 21,439 lb over 1,500 miles ultimate. Minimum landing and take-off distances are, respectively, 1,610 and 1,750ft. A prototype may be financed with company money and could fly in twelve months' time.

Reggie Brie Retires

THE end of April was a milestone for one of British aviation's best known exponents of rotating-wing flight, W/C. R. A. C. Brie, A.F.R.Ae.S., A.F.I.Ae.S. It marked his retirement, at the age of 61, from his present post of official-in-charge of B.E.A.'s Helicopter Experimental Unit, a position he has held for the past ten years.

Reggie Brie served in the R.F.C. in the first world war and from 1930 to 1940 was with the Cierva Autogiro Co. Holder of British Helicopter Certificate No. 1, he was the first British pilot to fly the Sikorsky helicopter.

Jean Lennox Bird

WE regret to record that Miss Jean Lennox Bird, who in 1952 became the first woman pilot to qualify for R.A.F. wings, was killed last Monday shortly after taking off in a Miles Aerovan from Ringway Airport, Manchester. Two other occupants of the aircraft, which was owned by Meridian Airmaps, Ltd., of Shoreham, also lost their lives in the accident; Mr. Christopher Harman and Mr. D. G. Willcocks.

At the time she qualified for her flying brevet Miss Bird (then a pilot officer) had some 3,100 hours to her credit, on more than 90 aircraft types.

Daimler-Benz Agreement

AN agreement has been concluded between Daimler-Benz A.G., of Stuttgart, and the American Curtiss-Wright Corporation, Studebaker-Packard Corporation and Utica-Bend (a motor-manufacturing firm) concerning the expansion of exports of Mercedes-Benz cars, commercial vehicles and engines to the U.S.A. At a later date, the maintenance of Curtiss-Wright aircraft engines, and their production under licence in Germany, will be undertaken. The agreement will eventually result in co-operation "in the production of aircraft engines."

Helicopters at Suez

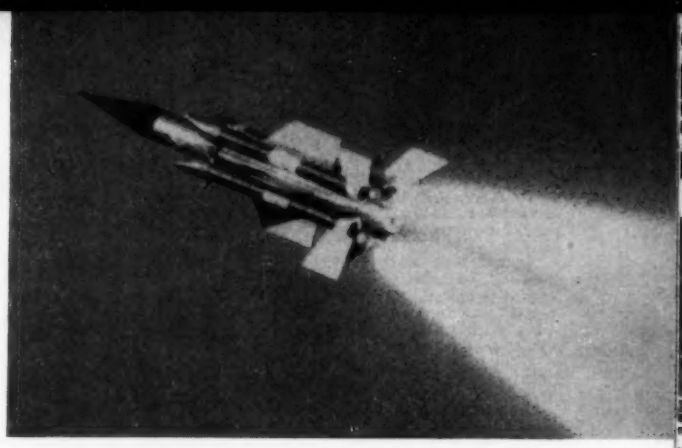
A LARGE audience gathered at Londonderry House on Thursday of last week to hear a lecture by Lt-Col. J. F. T. Scott, T.D., R.A., who commanded the Joint Experimental Helicopter Unit in the recent operations in the Middle East. The meeting was arranged by the Helicopter Association in conjunction with the Royal Aero Club; and Lord Brabazon, president of both bodies, presided.

Lt-Col. Scott gave an interesting account of the part the helicopters had played in the landings. Originally, when the operation was being planned in the nature of a precautionary exercise, it had been intended that their rôle would be casualty evacuation. Later, however, it was decided to attempt the landing of commandos on the beach-head. The helicopters worked a shuttle service to lift over 400 officers and men from the ships lying a few miles offshore in a period of 80 minutes. Turn-round time on the deck, for refuelling and re-equipping, was reduced with practice to six minutes. Subsequently, a large volume of stores and equipment was flown in to support the landings.

The remainder of the first day was spent in evacuating casualties, of which over 100, including a number of Egyptians, were flown back to the ships for medical attention. The lecturer cited the instance of one unfortunate (or perhaps fortunate) commando who was back on board having a wound dressed in the sick-bay only 19 minutes after he had first left the ship to take part in the assault; he had fought his short-lived battle in the intervening period. Lt-Col. Scott emphasized that the complete success of the helicopter operations had been mainly due to careful preparations during the work-up period immediately beforehand. This had been the first entirely British helicopter operation of this nature and the machines [Whirlwinds and Sycamores] had shown up to good advantage in every rôle that had been undertaken. Many of the tasks could have been accomplished in no other way.

More about British Guided Missiles

English Electric, Bristol and D.H. Disclosures



Similar in external appearance to the Army's future anti-aircraft missile, an English Electric test vehicle blasts off from its launcher.

OFFICIAL permission has been given for the publication of certain information concerning the three most important near-operational British guided-weapon systems: the surface-to-air programmes by English Electric and Bristol/Ferranti and the air-to-air by de Havilland Propellers. The following text comprises statements issued by these companies, amplified by our own appendices. Of particular interest are various accounts, given by the firms, of early development work.

English Electric: "The English Electric Guided Weapons Division located at Luton and Stevenage has under development an anti-aircraft guided weapons system capable of intercepting and destroying enemy air attack.

"From the outset the weapon has been designed for efficient and reliable operation in the hands of Service personnel under a wide range of operational conditions. Assembly and test of component parts can be done in the minimum of time, while loading, setting up, final test and firing are straightforward. Components are packaged and readily accessible so that maintenance by replacement becomes a relatively simple operation. An efficient defence can, therefore, be obtained with the minimum of Service manpower. Experience has shown that the English Electric guided weapon system is capable of very rapid assimilation into the Services without expensive training programmes. . . .

"The complete weapon system has been designed with reliability as the prime factor. In this field the works at both Luton and Stevenage, with their wide variety of modern test equipments, are superior to any in Europe. This equipment is capable of simulating flight conditions. Missile components are thus tested again and again during design to ensure the utmost reliability when in the hands of Service personnel.

"The development of the missile has been greatly facilitated by the fact that the English Electric Group can cover from its own resources all the varied techniques required for the complete weapon system. With simplicity of assembly and operation as the keynotes of design, quantity production is thereby facilitated. The English Electric Group has a large production potential within its many factories and this, with some degree of specialized tooling and organization, is capable of rapid expansion. The spread of skills and the wide resources available make for flexibility so that rapid increases in production can be met with the minimum of delay.

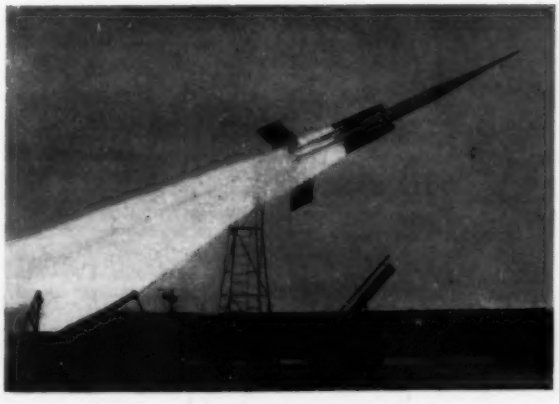
"The weapon is simple yet deadly in operation, cheap to produce and to maintain and is backed by an organization whose production capacity and facilities are without equal in Europe."

A photograph of an English Electric test vehicle was published on p. 885 of our "Missiles" special issue last December 7; a diagram appeared on p. 895. Several hundred development rounds have been fired both at Aberporth (*Flight*, November 2, 1956) and Woomera. Last week English Electric showed a film of tests against balloon-hung targets and Firefly drones.

In all cases the miss-distances have been "acceptable" (a proximity fuse is, of course, fitted). The weapon can have various types of warhead. Overall performance is rated better than the U.S. Army's Nike Ajax and "generally of the same order as Nike Hercules."

Originally the weapon was designed to use a Napier liquid-propellant sustainer motor, but an alternative version has a solid-fuel motor with equal performance. Marconi are mainly responsible for the guidance and electronic parts of the system. Drop-testing on to lead blocks is a standard procedure to prove the ability of components and airframes to withstand acceleration at launching. The historical film depicted test drops of complete vehicles from a Lincoln in order to prove air brakes, parachute system and recovery nose-spike. Service personnel have been attached to English Electric for more than four years and over 100 have been under instruction during the past twelve months. A production order was placed a few weeks ago and bulk deliveries should start by the end of the year.

This action shot depicts Bristol's Bobbin, test vehicle for the Thor ramjet, which also powers the R.A.F. Bloodhound anti-aircraft weapon.



Bristol: "The Bristol Group of companies and the Lancashire electrical engineering firm of Ferranti have been collaborating on the development of guided weapons for the air defence of the United Kingdom since 1949. Together the two firms have one of the largest combined work-forces on guided weapons in Europe. Four Bristol and two Ferranti factories are now heavily committed to various forms of guided-weapon production for the British government. Bristol's drawing offices at Filton and London are also engaged on this work. The most important single activity is the development and production of surface-to-air missiles for Service use.

"Bristol Aircraft, Ltd., has borne the overall responsibility of the successful development of Bloodhound—one of the first practical guided weapon systems in the United Kingdom. Bristol Aero-Engines, Ltd., have concurrently developed and is now producing the ramjet power units used to drive the missiles; Ferranti, Ltd., have devised, and designed, and are producing, the intricate radar and servo-control equipment needed to guide the weapon automatically to its target.

"Many hundreds of rounds of surface-to-air missiles have been fired both from the Aberporth range, on the Welsh coast, and the Woomera range in Australia. The development of the weapon has proceeded from the outset without major redesign, and this largely accounts for the speed with which it has been ordered into production. It is also the reason why photographs of early missile tests cannot be issued, because they would show too much classified information.

"It must be stressed that Bloodhound is more than just a surface-to-air guided missile; it is a complete defence system which has been designed and tested to act as such. In simple terms, the missile system operates in the following way: radar stations at strategic points around the coast give early warning of the approach of enemy aircraft, and this information is passed automatically to the control post of the nearest battery of missiles. The control post automatically assesses when the target is within range and sends out signals which fire off as many missiles as necessary. The system could differentiate between one aircraft and two flying in close formation, thus permitting each to be attacked separately.

"Bristol's factory at Cardiff is engaged on this guided-weapons work, as is Ferranti's at Manchester. Teams of Bristol and Ferranti scientists are based alongside Service and Ministry personnel both at Aberporth and Woomera. Bristol/Ferranti have worked closely with the Ministry of Supply and the British Services in the development of this weapon.

"Power source for Bloodhound is a Bristol ramjet engine of the Thor type—a unit developing tremendous power at very high speeds in the upper air. Extensive flight testing of the engine has been undertaken at the Aberporth and Woomera ranges, making use of over 200 test vehicles. Because ramjets operate efficiently only at supersonic speeds these vehicles are given an initial boost by rockets which accelerate the missile from rest to more than 1,000 m.p.h. in a few seconds, during which time the ramjet starts and attains full power.

"This engine is now fully developed, fully reliable and ready for service. Ramjet power gives great flexibility of operation which cannot be matched by a rocket-powered missile. The ramjet uses only about one-tenth of the propellant required by a rocket and therefore makes possible extremely long-range interception. The speed and altitude capability of the ramjet-powered missile are comparable with those of the rocket; the ramjet can also fly at high speed at low altitude.

"Bristol Aero-Engines, Ltd., have built up extensive facilities for ground-running ramjets and their component parts. Aerodynamic laboratories and engine test cells have been constructed and supplied with large quantities of highly compressed air to produce the supersonic airflow required to simulate the necessary flight conditions.

"Development of the ramjets began about five years after the war when Bristol received a contract from the Ministry of Supply to develop

More About British Guided Missiles . . .

the twin-ramjet test vehicle. With the help of information from the Royal Aircraft Establishment and on the foundation of experience derived from a collaborative agreement with the Boeing Airplane Company, the company put in hand an intensive programme of research and flight trials.

"In July 1951 the first objective of the development programme was reached: a vehicle was fired and telemetry readings showed that its engines produced thrust approximately equal to the drag of the vehicle. A short while later, another test firing achieved the further success of being the first British-designed and built ramjet missile to give positive acceleration in supersonic flight.

"Since those early days the Bristol effort in the ramjet-powered guided weapon field has been considerably expanded. An extension to Bristol Aero-Engines' test plant is now approaching completion. In this plant very-high-altitude conditions will be simulated by enclosing the test engine in a steel drum in which a partial vacuum will be maintained by a battery of steam ejectors.

"Ferranti have built up research and development facilities comparable in manpower to those at Bristol. In their laboratories, after extensive research, they have designed and developed the radar and electronic circuits, servo-mechanisms, gyroscopes and other highly specialized equipment which control the weapon in its flight. . . .

"Ferranti leads the field in printed electronic circuits, a technique which has proved of great value in solving the crucial problem of reliability, on which the success of guided weapon defence so largely depends."

From the Air Estimates it seems that the Bloodhound is the chosen surface-to-air weapon for R.A.F. use; English Electric's competing weapon (also, as already stated, now ordered in quantity) is not mentioned and may be presumed to have been adopted by the Army.

We published a brief illustrated description of Bobbin, the twin-Thor test vehicle, in our issue of March 29 last. It is likely that Bloodhound will be of generally similar size and configuration. Like the English Electric weapon, it can be quickly and easily split into interchangeable sections and components. Bristol have stressed that their whole system—launchers, control radar, the missile, propulsion and guidance, and test gear—is simple and reliable and "could be adopted by many other countries and used within their existing defensive organization."

de Havilland: "de Havilland Propellers, Ltd., of Hatfield, may now state that they have mastered the problems of the design and development of an air-to-air guided weapon which employs a system of infra-red target homing. This weapon, named Firestreak, has been chosen and ordered for the Royal Air Force: it will be fitted as standard equipment to certain of the most important British fighter aircraft. [P.1 and Javelin.—Ed.] An organization for the production of Firestreak has already been built up in the north and south of England, and several thousand technical staff and manufacturing personnel are now engaged upon this work.

"When de Havilland Propellers began work, their aim was to develop a weapon with a guidance system which would enable it to engage high-speed bomber aircraft at great heights: the infra-red system was chosen after careful comparative study. The infra-red system possesses qualities of great range and sensitivity, and is immune from the jamming which it is possible to employ against conventional radar weapons. The system employs a detector eye sensitive to the infra-red rays emitted from an aircraft: this eye, once it has locked on to the target, feeds information into the control system to ensure that the weapon continues to travel in the correct direction, no matter what manœuvre the target may perform.

"The components of Firestreak fall into six main sections. These are the guidance, control and fusing systems, the power supply, the propulsion motor and the warhead: they are housed within an aerodynamic body tube fitted with four wings and four control fins. The parent fighter carries Firestreak on an under-wing launching shoe; weapons may be fired singly or in pairs, and provision is made for jettisoning. The ancillary equipment required in the parent aircraft has been designed and developed by de Havilland Propellers in parallel with the main Firestreak project.

"When de Havilland Propellers took the decision to enter the guided-weapon field, they did so with a background of electronic, hydraulic and precision engineering gained over many years in the design, development and manufacture of aircraft propellers. This provided the nucleus of technical direction upon which a completely new team was built. Starting from a handful of engineers under the technical lead of Mr. G. C. I. Gardiner, technical director and chief engineer, an organization of many hundreds has been built up. This staff, together with the manufacturing personnel, now totals several thousand engaged upon this project alone. . . . The first members of the guided-weapon team were Mr. G. H. F. Brown, Mr. R. N. Hadwin, and Mr. J. Mullin, who had been until then respectively chief designer, chief vibration engineer and chief dynamicist of de Havilland Propellers, Ltd.

When the Ministry of Supply awarded the company a development contract for a turbo-alternator, a compact form of electrical power supply, which was required by other companies engaged on the development of guided weapons, the company were encouraged to expand their equipment resources and to recruit further senior technicians. Key members of the team who joined at this time included Dr. G. H. Hough, now the systems engineer, Mr. C. de B. White, who is today the chief trials engineer, and Mr. F. J. Costigan, who came to the company with previous knowledge of guided-weapon design, and is now chief designer of air-to-air weapons.

"Subsequently a contract was received for the development of an infra-red homing-head, on which early work had already been carried out by the Ministry of Supply Radar Research Establishment. The guided weapons team expanded rapidly and the provision of additional factory space, manufacturing capacity and techniques was expanding at an equal rate both at Hatfield and in Lancashire.

"A development contract for a complete guided weapon was awarded in the light of the successful completion of the work on the turbo-alternator and the homing head. The main design requirement was that the weapon should be reliable and easy to handle in service. At an early stage of the work, therefore, de Havilland Propellers decided to design and manufacture all components of the weapon themselves, with the exception of the propulsion and explosive units, which could be produced by existing facilities within Government establishments. Although many of the problems required specialist knowledge, it was felt that the basic skill existed within the company, and thus the difficult and complex problems of co-ordinating design and development between several different companies spread throughout the country could be avoided. This decision contributed largely towards achieving the final results in the shortest possible time.

"The first flight trials were begun under the direction of Mr. White at the Royal Artillery range at Larkhill. After initial trials to check boost separation a number of weapons were fired with the turbo-alternator installed to check the performance of the power system under the high stresses occurring during flight. Although the weapons were, for reasons of safety, destroyed in the air after a flight of a few seconds, adequate information on the performance of the specific system under test could be transmitted to the ground receiving station in that time.

"Weapons containing both power and control systems were fired next to check the response of the control system to pre-arranged signals. The final stage before a fully guided round could be fired was to check the performance of the homing head in flight when locked on to a target but not controlling the flight path of the weapon: as in the previous phase all data during flight was transmitted to the ground by telemetry.

"At last, with full control and guidance systems linked together, the first complete Firestreak was fired at Larkhill. The launching was carried out at night. Firestreak was fired at a target several miles distant from the launching site: this target took the form of a large wire frame which carried heaters to simulate the radiation from an aircraft. . . . The eager team of observers, which included Mr. Gardiner and Mr. White, found that Firestreak had scored a direct hit. . . .

"An extensive re-equipment programme was commenced at the main Lostock factory to make ready for the full flow of production. A large quantity of new machine tools and equipment, suited to the new and exacting standards demanded for weapon manufacture, was purchased.

"The first air trials began during the middle of the ground-launching tests. Trials were carried out over the Aberporth range, initially to test that the weapon could be jettisoned safely. The aircraft used was a [two-seat.—Ed.] de Havilland Venom, flown by Mr. D. de Villiers, then chief test pilot of de Havilland Propellers.

The first round launched from under the wing of an aircraft was fired from the Venom standing on Pendine Sands, near the Aberporth range. The nose of the aircraft was pointed out to sea and jacked up, and an anti-blast door was fitted over the undercarriage. Mr. de Villiers and Mr. White entered the cockpit and adjusted their safety straps. Mr. White pressed the firing button, and the missile left the aircraft successfully. No damage or marking was sustained by the aircraft.

"The way was now clear for flight firing trials to begin, and a weapon was fired from the Venom flying over the Aberporth range. This was merely a trial launching: no target was employed. The

(*Continued on page 570*)

Firestreak, the R.A.F. air-to-air missile by de Havilland Propellers, undergoing functional checking on the overall-test console. Electric and compressed-air lines make the weapon alive while the box over the "business end" injects intelligence. (The roundels on these missiles have been known to produce the facetious comment, "All right, it's one of ours.")

THE AIR ESTIMATES

Nuclear Potential : Missiles : Guided Bombs : Twin Pioneers

THE net total of Air Estimates* for 1957-58—made public on Thursday of last week—is £487,650,000, compared with £477,450,010 for 1956-57 (as adjusted by the Revised and Supplementary Estimates). This allows for: (a) the receipt of £9,500,000 from the U.S.A. in payment for equipment for the R.A.F. (the corresponding figure for 1956-57 was £38,000,000); and (b) the receipt from the Federal German Government of Deutschemarks to the value of £9,000,000 (this is expected to be enough to meet most of the local expenditure incurred in the year). Without deducting receipts from the U.S.A. and Germany, the comparison is between £506,150,000 for 1957-58 and £524,950,010 for 1956-57.

The Estimates were accompanied by the customary explanatory memorandum † by the Secretary of State for Air, Mr. George Ward, points from which are here abstracted.

R.A.F. effective manpower is about 230,000; it will fall to about 210,000 by April 1958. Contraction of front-line strength will be offset by new weapons and increase in nuclear potential. Principles of air power remain unchanged.

The Valiant element is at full strength. Vulcans are in service and the Victor will follow this year. Stocks of nuclear weapons are increasing, together with Bomber Command's ability to carry them. The atomic bomb dropped from a Valiant at Maralinga last October fell within 110 yd of the aiming point. Preparations are well advanced for trials of megaton weapons. The V-bombers are now supported by Comets, and increased flexibility is thus provided by transports operating in the same speed range. Improved marks of V-bombers will carry a powered guided bomb. Ballistic missiles will gradually play an increasingly important part in the offensive deterrent. Agreement in principle has been reached with the U.S.A. to make intermediate-range ballistic missiles available to this country.

Defences are being recast in order to concentrate on the defence of nuclear bases. The Javelin is well established and well liked. Day-fighter squadrons are equipping with the Hunter 6 and an order has been placed for the P.1. The control and reporting system is being planned in relation to missiles and, in due course, to defence against ballistic missiles. The very high performance of our new radars is being exploited to the full, and is enabling us to streamline the control and reporting organization and reduce the number of stations. The R.O.C. have practised their new task of reporting and tracking radio-active fall-out.

Acceptance trials of the Fireflash missile have been encouraging and aircraft have been shot down at operational ranges, even by weapons without warheads. Service trials are about to begin with Fireflash, using Swifts; these will establish tactical doctrine and operational characteristics. The Firestreak, following closely behind Fireflash, will shortly begin acceptance trials and will equip Javelins and P.1s.

Surface-to-air guided-weapon simulators will reduce flying by target aircraft and permit operational techniques to be developed with as few firings as possible of expensive missiles. Missiles will be fired against drone targets over the Hebrides range. The first R.A.F. missile station is under construction at North Coates, Lincs, and will be brought into use for service trials in 1958. The station will initially be used to discover how the system performs under service conditions and will later form part of the operational deployment. Officers and men will be trained there for other stations.

Equipment has been ordered for an initial operational deployment of Bloodhounds and more advanced missiles are being developed. It is intended to fit missiles with atomic warheads. To co-ordinate missiles and their radar, and integrate them with existing control and reporting and fighter systems, a new organization is being set up. (See page 573.)

The reduction in elements of 2nd T.A.F. will be offset by the higher quality of Hunter 6s. Reduction in the Bomber Command Canberra force will be much more than counterbalanced by the nuclear capacity of the remaining squadrons. The long-range M.R. force is wholly equipped with Shackletons; the Mk 3 will soon enter service, and the Shackleton's capacity to deal with submarines is being improved.

In the Middle East and Far East our policy remains to provide small air forces of high quality, ready to receive reinforcements from the U.K. Canberras and Hunters are being introduced into M.E.A.F. and F.E.A.F., and Twin Pioneers have been ordered for eventual deployment in those theatres. In support of Malayan operations, Pioneers have been flying an average of 600 sorties each month. The war-time airfield on Gan, in Addu Atoll, is to be rebuilt as a staging post on the route to Australia, New Zealand and the Far East.

The Comet 2 squadron has flown more than a million miles since last year. The Comet 2 is a popular aircraft and can make two return flights to Cyprus in the same time that it would take a Hastings to make one. The reliable and versatile Hastings has an indispensable part to play for many years to come. In the Britannia Transport Command will have a truly long-range aircraft. A third Beverley squadron will form shortly.

A substantial order for the Jet Provost is being placed. The Canadian scheme for NATO training is coming to an end; over 3,700 R.A.F. pilots and navigators will have been trained in Canada since the war. The major-accident rate for all flying has been held at the record low level achieved last year, while the fatal-accident rates for both jet- and piston-engined aircraft have shown further improvement.

Between 1954 and the beginning of this year about 700 officers of the G.D. branch attended a short guided-weapons course at the R.A.F. Flying College. From the beginning of this year a more intensive and detailed course has been arranged for 36 G.D. officers a year destined for staff posts and posts on operational stations. For technical personnel, since 1951 some 120 officers and several hundred airmen have attended courses. From this year onwards it is planned to train every year about 130 officers of the Technical Branch and a rather greater number of airmen.

The Memorandum concludes with statements on man-power, works and land, and meteorology.

THE VOTES

THE Estimates are divided into "votes", each covering one field of expenditure. These votes are listed below, the gross estimate being followed in each case by the figure for 1955-56 in parentheses.

The numbered votes are preceded by Vote A, laying down strength in personnel. The maximum number of officers, airmen and airwomen to be maintained for service is 240,000—a decrease of 17,000.

Vote 1: Pay, etc., of the Air Force.—£109,670,000 (£113,660,000). The decrease is mainly due to lower average strengths, the effect of which is partly offset by an under-estimate in 1956-57 of the expenditure on officers' pay.

Vote 2: Reserve and Auxiliary Services.—£2,685,000 (£3,197,000). Decrease is mainly caused by a reduction in the training to be carried out by reserve personnel and the disbandment of certain units of the R.Aux.A.F.

Vote 3: Air Ministry.—£5,173,000 (£4,987,000). Increase is chiefly due to improvements in the rates of pay of most grades, the effect of which is partly offset by lower average strengths.

Vote 4: Civilians at Outstations.—£42,860,000 (£41,376,000). This increase in the gross total is mainly associated with improvements in the pay of all grades, partly offset by a reduction in the number of civilians (mainly industrial employees).

Vote 5: Movements.—£16,750,000 (£16,860,000). The £110,000 decrease is principally by reason of lower average strengths of officers and airmen and an unexpected reduction in rail journeys, partly offset by provision for increased cost and volume of movements of personnel by sea and air.

Vote 6: Supplies.—£75,860,000 (£80,390,000). Decrease in the gross total is mainly caused by reduced provision for liquid fuel, arising from reductions in expected consumption. The decrease is partly offset by increased prices and higher rates of duty on liquid fuel. Higher costs of solid fuel, increased costs and consumption of electricity, and an increase in the cost of rations and ration allowance consequent on the introduction of improved scales are partly offset by the effect of lower strengths.

Vote 7: Aircraft and Stores.—£247,000,000 (£263,000,000). Decrease of £16,000,000, due principally to estimated lower expenditure on aero-engines, armament, mechanical transport vehicles, general stores, and clothing and clothing allowances. This reduction is partly offset by increased provision for airframes.

Vote 8: Works and Lands.—£75,720,000 (£72,520,000). Increase mainly owing to greater provision for new works, including those required for other governments.

Vote 9: Miscellaneous Effective Services.—£9,765,000 (£10,066,010). Decrease chiefly by reason of reduced requirements for educational services for children at stations abroad and a decrease in the requirements for special telephone circuits and for maps and charts.

Vote 10: Non-effective Services.—£7,580,000 (£7,366,000). The increase is principally attributed to the growth of the retired pay and pensions lists. It is partly offset by reduced provision for gratuities consequent on a decrease in the numbers of officers and airmen expected to complete their active service.

Vote 11: Additional Married Quarters.—£2,300,100 (£4,200,100). All but £100 of this gross vote are met by appropriations in aid.

* *"Air Estimates, 1957-58", price 9s 6d, Her Majesty's Stationery Office.*

† *"Memorandum by the Secretary of State for Air to accompany Air Estimates 1957-58", price 8d, H.M.S.O.*

NAVY ESTIMATES

Carrier, Missile-ship and Aircraft Planning

ISSUED on April 26, the Admiralty's explanatory statement on the Navy Estimates * poses the question "How will the policy of having substantially smaller armed forces, and of reducing our overseas garrisons, affect the responsibilities of the Royal Navy?" This is answered in the following terms: It leads logically to the conclusion that the new Navy must play a full part in meeting peace-time overseas commitments. This can best be done by reorganizing the Navy into Task Groups, built around the air power of the carrier.

The statement goes on to report that the front-line carriers at present in the Active Fleet are *Ark Royal, Eagle, Albion* and *Bulwark*. *Bulwark*, employed last year on flying training, has now replaced *Centaur* in the Active Fleet so that *Centaur* can be modernized. The construction of *Hermes* continues and *Victorious* is due to complete her modernization at the end of this year. *Victorious* will be the first carrier in service with a fully angled flight deck. She will have steam catapults, new radar and landing-control systems, and the latest arrester gear. Her modernization has included re-boilering, the installation of new armament and improved accommodation. She will be able to operate all existing and planned naval aircraft, and will have the equipment and facilities to arm them with air-to-air guided weapons.

The next carrier in the modernization programme will be *Eagle*, which will be taken in hand after *Victorious* has joined the Active Fleet. *Eagle* will in fact be brought up to the same standard as *Victorious*, but as she is a much newer ship the cost will be considerably less. Various considerations—above all the financial limitation—make it impossible to aim at so high a standard in the case of all our operational carriers. However, the modernization of *Warrior*, carried out before she was sent on special duties in connection with the forthcoming nuclear tests, included the partially angled flight deck and improved arrester gear; and *Centaur*, having an angled [partially—Ed.] deck already, is to be equipped with steam catapults and new arrester gear.

It has been found possible to equip the new design of Fleet Escorts with guided weapons. Orders have been placed for four of these vessels, which will be the first to be armed with the Sea Slug guided missile [a surface-to-air weapon by Armstrong Whitworth—Ed.].

Of H.M.S. *Girdleness* it is stated, "The Navy's experimental guided weapon ship was commissioned last July and has since carried out a number of trials. In September her first test missile, from which the sea-to-air guided missile is being developed, was successfully fired and other satisfactory firings have followed. Progress in equipping the Navy's new class of guided missile ship with their weapon systems will, of course, be largely dependent on the success of the *Girdleness* trials."

The aircraft carrier *Ocean* is employed in non-flying training and *Warrior* in "special trials". Under the heading "Ships at Present in all Classes of Reserve or Undergoing Extended Refit, Modernization, Conversion, etc.", are the carriers *Victorious, Centaur, Triumph, Glory, Theseus* and *Magnificent*, the aircraft repair ship *Perseus* and the aircraft maintenance carrier *Unicorn*. In course of construction is one carrier—*Hermes*—*Hercules* having been sold to India and construction of *Leviathan* having been suspended.

The Scimitar is expected in the Fleet by the middle of 1958, and the first deliveries should be made during the current financial year. Intensive flying training will soon begin. The Sea Vixen is also coming along well, and the production programme is up to date. Its armament includes air-to-air guided weapons, which have already been fired under test conditions. The N.A.39 strike aircraft will have a considerable range and ability to carry an atomic bomb. It will be "a most formidable" addition to the Royal Navy's striking power. Considerable numbers of Whirlwind helicopters will be delivered during the coming financial year for use in the anti-submarine rôle. These aircraft, which can also carry troops, are expected to be in service in the second half of 1957.

* *"Explanatory Statement on the Navy Estimates, 1957-58", by the First Lord of the Admiralty. Price 1s 3d, H.M.S.O.*

MORE ABOUT BRITISH GUIDED MISSILES (continued from page 568)

weapon left the aircraft successfully and followed the designed flight pattern after launching . . .

"After further air-launching trials, the Venom was armed with the first complete operational round. A radio-controlled target aircraft, fitted with heaters to simulate radiation from a modern aircraft, was put into the air, and Mr. M. P. Kilburn, the new chief test pilot of the Propeller Company, pursued it in the Venom. The weapon . . . scored a direct hit on the target, which crashed into the sea.

"A continuous programme of air firing has since been carried out at Aberporth. Every firing has yielded valuable information and has led to progressively greater precision. The percentage of direct hits has become consistently higher.

"It had always been recognized that the Aberporth range was too limited in size to allow high-speed target aircraft . . . to be used. An additional disadvantage was the impossibility of recovering weapons from the sea. Excellent facilities, however, were available at the rocket range at Woomera, in Australia, and a small test team was established there early in 1955 with the assistance of Mr. T. W. Air, of the de Havilland Aircraft Pty., Ltd., of Australia. The Woomera test programme began with a number of successful familiarization tests using a Sabre aircraft. Firings carried out later against a Jindivik . . . were completely successful and several targets were destroyed.

"In a brief space of time, de Havilland Propellers have designed, developed and put into production a weapon which has proved to be of exceptional merit. Existing factories have been re-equipped, and new premises have been acquired. A large factory is nearing completion beside the Company's existing factory at Walkden, near Lostock, in Lancashire, and this will be used solely for the assembly of Firestreak.

"A servicing organization has been built up. Instructors at Hatfield are busy initiating Service personnel into the use of their new weapon. In Australia the Propeller Company has set up two establishments at Salisbury and Woomera and in that country valuable assistance in staffing these is given by de Havilland Aircraft Pty., Ltd., from their factory near Sydney.

"Throughout this work the closest support and encouragement has been given to de Havilland Propellers by the Ministry of Supply and their various technical establishments, by the Royal Air Force, the Royal Australian Air Force, the range authorities at Larkhill and Aberporth, and the Weapons Research Establishment at Woomera. Thanks go to them for the parts each has played."

De Havilland's weapon bears a weighty responsibility as our only air-launched missile near to squadron Service. The picture shows it to resemble the model test vehicle exhibited at Farnborough 3½ years ago, with the exception of having an appreciably greater wing span (perhaps indicating an improved performance at altitude). Overall length is some 12ft, and the weight is probably more than three times as much as that of the smaller and less potent American counterparts like Falcon and Sidewinder. Compared with Fireflash (Fairey Aviation's weapon, already in limited production) Firestreak has a very much greater body volume, indicating an increase in warhead lethality.

MISSILES AND THE R.A.F.

A PRESS conference held last week by the Air Ministry produced several statements of considerable magnitude regarding the R.A.F. employment of unmanned weapons.

In the field of offensive weapons the "major R.A.F. effort" had been applied to the stand-off bomb and the ballistic missile. The former, which would be in service first, was a self-propelled air-to-ground weapon with a nuclear warhead which could be carried by a V-bomber to within "some hundreds of miles" of the target (well outside the range of ground-launched missiles). The weapon would then be released and would find its target automatically.

It has been announced by A. V. Roe that they are associated with development of such a weapon. (The Strategic Air Command of the U.S.A.F. have been using a missile of the same sort—the Bell GAM-63 Rascal—for a considerable time.)

The conference produced supposedly theoretical statements regarding winged surface-to-surface weapons—implying that, were Britain to develop such things, the R.A.F. would be the Service responsible for their operation. It was also stated that the R.A.F. regarded the ballistic missile as "close to the ideal deterrent weapon." (Previously it had been assumed that the British Army would be solely responsible for operation of our ballistic missiles, of either British or American origin. Nothing official has yet been said regarding our industry's work on such devices, but it has been reported in both the British and foreign Press that two of the firms engaged in such work are English Electric and de Havilland.)

Regarding defensive weapons, trials with the Fairey Fireflash training missile had been "very encouraging." Many Fireflash had been fired at Meteor drones from Swift 7s of a unit commanded by W/C. J. O. Dalley. No estimate of the date of introducing the Firestreak could be made until its reliability had been fully assessed. As things stand at present the Firestreak will be the first operational R.A.F. missile, and it should be followed into service some time next year by the Bloodhound surface-to-air weapon.

CIVIL AVIATION

K.L.M.'s VISCOUNT CHRISTENED

THE first British airliner ever to be built for the great Dutch airline K.L.M. inspired the pleasant and historic ceremony, depicted in the heading picture, which took place at London Airport on April 26. Though it may be coincidental that the aircraft —K.L.M.'s first Viscount 803—bears in its registration letters the same initials as those of the airline's president Mr. I. A. Aler, it is no coincidence that it bears the illustrious name *Sir Sefton Brancker*. "He was a pioneer," said Mr. Aler, "and for that reason his name has been chosen to grace the first K.L.M. Viscount 800, an aircraft which has upheld the best in British ingenuity and technical skill."

The naming ceremony was appropriately performed by the late Sir Sefton's son, Mr. John Brancker, now a member of I.A.T.A.'s executive committee in Montreal (whence he and his wife had flown especially for the occasion). It was especially appropriate that Lady Brancker also was present.

The spirit of the occasion was perhaps best summed up by the chairman of Vickers Armstrongs Aircraft, Maj.-Gen. C. A. L. Dunphie, who remarked that, for the first time, K.L.M. had not crossed the Atlantic to buy its aircraft. He hoped that the purchase of Viscounts in England "would prove a cheaper fare."

Delivery of the remaining eight Viscounts for K.L.M. is due to be completed by October: the remaining aircraft will be handed over at the rate of two a month until October. They will have mixed-class accommodation—the first Viscounts to be so furnished—with 40 tourists five-abreast in the forward cabin, and 15 first-class passengers four-abreast in the aft cabin.

K.L.M.'s first Viscount is seen here at L.A.P. last week being christened "Sir Sefton Brancker" by the late pioneer's son, Mr. John Brancker. (See column 1.) The ceremony was appropriately performed with a bottle of Dutch gin.

"Flight" photograph

B.E.A.'s PROFIT

EVEN when interest on capital and other charges have been deducted from B.E.A.'s gross profit, which is now confirmed as more than £500,000, a "small net profit" will result. This good news was given last week by Lord Douglas, chairman of the Corporation. He remarked that this result had been achieved in the face of many factors beyond the Corporation's control, and these had kept traffic well below the level for which it had planned its operations.

For the record, the interest on capital and other charges which had to be deducted from the gross profit last year was of the order of £600,000.

B.E.A.'s total output was 139,079,000 c.t.m., and 89,685,000 l.t.m. Some 2,462,000 passengers were carried. These increases over the previous year were substantial, but the rate of growth was only about half that achieved during the previous year. A full analysis of the year's trading will be possible when the complete report and accounts are published later in the summer.

C.P.A.L BUY ANOTHER BRITANNIA

SINCE Canadian Pacific Air Lines signed their original contract with Bristol for three Britannia 314s in 1955 they have come back on two occasions with single repeat-orders. The airline has now confirmed a firm requirement for yet a further aircraft, bringing the total fleet to six. The option on five Britannias remains, as before.

This latest order brings the total of Britannias sold, as listed on page 580, to 66 aircraft.

RAIN-REMOVAL—LIKE ENGLISH

TYPICAL of the way the Americans get things across is the following extract from a speech made recently by James T. Pyle, C.A.A. Administrator. Although "circular polarization" is by no means new to British radar manufacturers, who incorporate it in their equipment, we doubt whether they have explained it as vividly as does Mr. Pyle:—

"Today's electronic wizardry always leaves me with a sense of awe and wonder. As the engineers explain it to me, circular polarization imparts sort of a corkscrew effect to a radar pulse—like 'English' on a billiard ball. This requires a phaser, twister and horn. When the pulse hits a raindrop it bounces back to the horn, this time with 'reverse English.' Then it is electronically cancelled out. The rest of the pulses continue on, hit the flat surface of the aircraft, and come back to register on the screen.

"This is effective because raindrops are round. Engineers never take anything for granted, I've found out, and when this matter first came up they wanted to know, 'Is a raindrop round, is it tear-shaped, or what? We have to know what we're designing for.' Fortunately, somebody already had made an intensive study of raindrops and discovered that they 'tend' to be round, so we could go right ahead.

"Interestingly enough, we found that, while raindrops are round sometimes, they aren't always. Gentle rain has round drops, but in turbulence they get blown out of shape, and the centre of the storm often remains on the scope. In some ways this is an advantage. Circular polarization also cancels out snow, but only if the flakes are of the perfect crystalline pattern seen on Christmas cards. Irregular and lumpy snowflakes refuse to cancel.

"Circular polarization somewhat reduces the range of the radar, so we permit the controller to use it or not, as circumstances demand. Generally speaking, however, it has provided a most useful improvement and has been enthusiastically received at Idlewild, Newark, Boston, Chicago and Washington, where it already has been installed. Thirteen other sites will have it by April 15, and we're going ahead with a programme to install it not only on all surveillance radars but on approach radars as well."

AIR FRANCE CHOOSE J75s

WHEN Air France announced their order for Boeing 707s on December 28, 1955, no indication was given of the type of engine that would be fitted. At one time the choice was said to be between the Pratt and Whitney J75, the Rolls-Royce Conway, and the British Olympus. When the airline recently placed a repeat-order for seven Boeing 707s, bringing the total fleet up to 17, the selection was then said to lie between the J75 and the Conway (*Flight*, March 15, 1957). It is now reported that Air France have finally decided on the Pratt and Whitney J75.

BREVITIES

THE Sud-Est Caravelle's tour of North and South America (the aircraft arrived at Rio on April 19) will last for more than two months. During this time 27 cities will be visited in Brazil, Argentine, Uruguay, Venezuela, the U.S.A. and Canada.

* * *

No definite conclusion was reached by the C.A.B.'s inquiry into the Grand Canyon accident last June 30. The report said that it was not possible to determine why the pilots involved did not see each other in time to avoid collision.

* * *

The Air Transport Association of America has proposed a three-dollar fine to be levied on "no-show" passengers. The proposal is subject to the approval of the C.A.B.

* * *

The eight-day strike by Qantas crews for higher pay ended on April 20, when both sides agreed to arbitration. Normal services have since been resumed.

* * *

A Hunting Percival President left Luton last Monday on a European tour of Dusseldorf, Hanover, Vienna, Zurich, Milan, Rome and Bilbao.

* * *

Qantas is to open negotiations in Washington later this month for permission to extend its services from Sydney to San Francisco across the U.S. continent to New York and thence to London.

* * *

It is reported that Croydon—London's former main airport—may be closed next year. It is likely to be required by the local authorities as a housing site.

* * *

A new transport "with two Rolls-Royce Tynes in pods mounted above the wing" is reported to have been designed by the Italian Aerfer group.

* * *

Swissair's new service to the Far East, terminating at Tokyo, was inaugurated on April 23.

HERE AND THERE

IROQUOIS—Orenda Engines' supersonic turbojet is now flying—mounted on the starboard quarter of this Boeing B-47, on loan to the R.C.A.F. from the U.S.A.F.

Weighty Record

AT Brough last Monday a Beverley flown by Blackburn test pilot Tim Wood parachuted a 13-ton load of steel and ballast. This is believed to be the heaviest single item ever dropped from an aircraft.

M.o.S. Missile Appointment

WITH the approval of the Secretary of State for Air, the Minister of Supply, Mr. Aubrey Jones, has appointed A. Cdre. H. B. Wrigley to be Director of Guided Weapons (Projects). Since 1954 A. Cdre. Wrigley has been engaged with the Air Ministry on radar and radio systems.

History at Hendon

USE of the Grahame-White hangar at Hendon aerodrome by the Royal Aeronautical Society as an exhibition hall for a national collection of historic aircraft has been approved in principle by the Air Council.

Anglo-Dutch Missiles ?

PRESS reports in Holland speak of co-operation between Netherlands and British manufacturers in the construction of guided missiles. Firms named are de Havilland and Mullard in England and Philips and the Hollandse Signaal-Apparatenfabriek in Holland, and it said that they have already been working together "for a long time."

B-52 Rallentando

IN Washington recently it was announced that production of Boeing B-52s had been slowed down from 20 to 15 a month. Mr. Charles Wilson, Secretary of Defense, said that the number of B-52s ordered by the U.S.A.F. would not be lessened but delivery of the last 603 aircraft ordered would not be taken until late in 1959, six months after the date set last year.

Uphill Work

SEVEN injured climbers were carried to safety from the Alps on April 22 in a Piper Super Cub fitted with a combined wheel and ski undercarriage and flown by the Alpine pilot Hermann Geiger, whose day's rescue work involved seven mountain landings. [His "uphill landing" technique was described in an article of that title in *Flight* for October 12 last year.]

Valuable Source

TITANIUM ore deposits near Jossing Fjord, in Western Norway, have been found to be even bigger than first believed. It is now estimated that there are 350m tons in the area, 166m tons of which have already been located.

Long Drop

A MEMBER of the Abingdon parachute group, Sgt. J. N. Hoffman, set up an unofficial delayed-drop record of 41 sec on April 23 when he jumped from a Tiger Moth at 8,400ft above R.A.F. Station Weston-on-the-Green and fell to about 2,000ft before opening his parachute.

Aircraft Safety Award

FOR the part he played in the flight-testing of Martin-Baker ejection seats the company's chief instructor, Bernard Lynch, has been awarded the Alston Memorial Prize for 1956 by the Royal Aeronautical Society. It was Mr. Lynch who made the first live ejection from an aircraft in this country when on July 24, 1946, he shot himself out of a special two-seater Meteor at 320 m.p.h. at 8,000ft in a prototype Martin-Baker ejection seat.

Link with the Past

A BALLOON ascent was made by Capt. Jan Boesman and members of the Hague Balloon Club at the North London exhibition at Alexandra Palace on April 22.

Canadian Training Extension

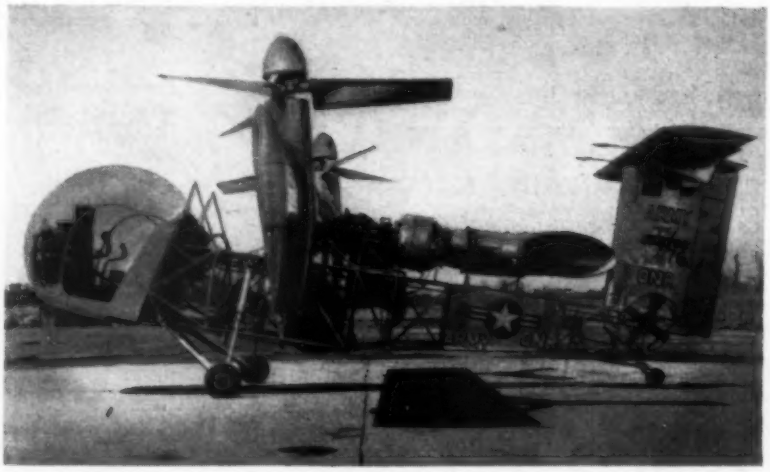
IN Ottawa the Canadian Government has announced a three-year extension of its NATO air training plan, providing for the training of 155 aircrew from Denmark, Norway and Holland. Canada is also training 360 aircrew from West Germany.

H.D.M. 105 Undercarriage

IN the description of the Miles H.D.M. 105 transport prototype with Hurel-Dubois wing, published on April 19, it should have been stated that, like its forerunner the Aerovan, the new machine is Goodyear braked and shod.

X-15 Progress

FROM Baltimore, Maryland, comes news that construction of the North American X-15 rocket research aircraft has been started. Defence Department officials in Washington are quoted as saying that the X-15 might reach a speed of 4,000 m.p.h. at altitude as high as 200,000ft. It will be "considerably lighter and smaller" than the X-1 and X-2 series of research aircraft.



TILT-WING prototype recently completed by Vertol is the Model 76 (above), powered by a single Lycoming T53 of some 800 h.p.

BREGUET 1100: Powered with two Turboméca Gabizo turbojets, Bréguet's new "tactical light fighter" (left) is now undergoing trials.

Brize Norton Extensions

PLANS for extending Brize Norton Airfield—in use by the U.S.A.F.—were explained by Air Ministry representatives to members of local authorities and interested bodies at a meeting on April 17. The Ministry stated that their plans would not involve closing the Brize Norton - Bampton road, subject to control of traffic when large aircraft were landing over it. Several suggestions were made for reducing the effect of the plans on local interests, and the Air Ministry agreed to take these into account as far as possible in their final plans, on which there is to be further consultation.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Three senior R.A.F. officers concerned with implementing the new defence policy outlined below. From left to right, Air Marshal Sir Geoffrey Tuttle, D.C.A.S. and Air Council member responsible for re-equipment policy; A.V-M. D. G. Morris; and G/C. J. A. Leathart.

Exercise "Vigilant"

THIS year's principal air defence exercise, to be known as "Vigilant", is to be held between May 25 and 28 and will be directed by the A.O.C-in-C. Fighter Command, Air Marshal Sir Thomas Pike.

Day and night attacks are to be concentrated into three raid-periods of maximum intensity, each of 24 hours' duration. "Enemy" sorties will be flown against the defences by Valiants and Canberras of R.A.F. Bomber Command, aircraft of Coastal and Training Commands and of the Fleet Air Arm, R.A.F. aircraft of 2nd T.A.F. from Germany, aircraft of the U.S.A.F. and Continental-based aircraft of the air forces of Canada, Belgium, France and Holland.

Guided Weapons Policy

CHANGES in the R.A.F. resulting from Britain's new defence policy were outlined in the Air Minister's memorandum on the Air Estimates and at a Press conference at Air Ministry on April 25, when the first appointments resulting from the advent into service of guided weapons were announced.

The most important of these is that of A.V-M. D. G. Morris as head of a new organization in the Air Ministry—as yet unnamed—whose purpose is described in the Minister's memorandum as "to co-ordinate and progress the introduction of defence guided missiles and their associated radar and to integrate them with the existing control and reporting and fighter defence systems."

A.V-M. Morris has been S.A.S.O. at 2nd A.T.A.F. since January 1955, and prior to taking the 1954 course at the Imperial Defence College was Metropolitan Sector Commander, Fighter Command. He was awarded the D.F.C. in 1941 and the D.S.O. in 1945 and this year was appointed an Aide-de-Camp to the Queen.

Another appointment announced was that of G/C. J. A. Leathart as C.O. of the first of the R.A.F.'s missile stations (at North Coates, Lincolnshire), which is to be brought into use for service trials next year. For the past three years G/C. Leathart has commanded the Air Defence Operations Centre at H.Q., Fighter Command. He was awarded the D.S.O. in 1940. A third announcement was that the Swift 7 unit engaged on trials with Fireflash is to be commanded by W/C. J. O. Dalley, who from March 1954 to October 1955 was C.O. of No. 141 (night fighter) Squadron at R.A.F. Coltishall.

At the conference, Air Ministry spokesmen said there was no reason to expect "startling changes" in the R.A.F.'s career or trade structure; it was wrong to think "push-button warfare was just around the corner". Bomber Command is being expanded and in certain operations aircraft would still predominate. There would, however, be changes—both in manpower ceilings and "evolutionary" ones—resulting from the introduction of new weapons. In future, G.D. officers would need to fly less after their first ten years' service, though this did not mean a separate class of guided missile officers would be built up.

Several hundred officers—both G.D. and technical—and airmen had attended guided-missile courses since 1951. There are to be new trades (e.g., guided-missile fitter) for airmen—and for this, by mid-January this year, there had been 600 applications. No present plan exists to introduce a special badge for guided-weapon personnel, and it is "unlikely" that the existing Commands will be given new names.

Standard for No. 32 Sqn.

ON June 6 a Standard is to be presented to No. 32 Squadron by Air Chief Marshal Sir James M. Robb at R.A.F. Akrotiri, Cyprus. The squadron invites past members to attend and those able to do so are asked to communicate with the Adjutant, No. 32 Squadron, Royal Air Force Akrotiri, Cyprus, B.F.P.O. 53.

R.A.F. Appointments

AMONG recent Royal Air Force appointments announced by the Air Ministry are the following:—

G/C. D. W. Smythe to R.A.F. Henlow, to command; G/C. H. N. G. Wheeler to the R.A.F. College, Cranwell, as Assistant Commandant; G/C. J. W. C. Revill to Air Ministry for duty in the Department of the Air Member for Supply and Organization; W/C. B. D. Sellick to H.Q. Transport Command, for air staff duties (with the acting rank of group captain).

R.C.A.F. George Medal Awards

TWO members of the R.C.A.F., F/L. R. G. Morgan and L.A/C. H. J. Waters, have been awarded the George Medal for their "prompt and courageous action" in rescuing the pilot of a Sabre which had crashed and caught fire while coming in to land at the R.C.A.F.'s No. 1 Fighter Wing, Marville, France.

Announcing the Queen's approval of these awards, R.C.A.F. headquarters in Ottawa quotes from the citation that F/L. Morgan and L.A/C. Waters acted "with complete disregard for their own safety" despite flames and exploding ammunition. Together they extricated from his cockpit the partially-conscious pilot, F/L. E. L. Fine, who later recovered from his injuries.

Railway By Air

A SMALL but complete railway system has been air-lifted and air-dropped into Fort Chabai by Whirlwind helicopters and Pioneer, Valetta and Freighter aircraft from R.A.F. Kuala Lumpur. Chabai, latest in the chain of Malaya's deep jungle forts established for anti-terrorist operations and to help in the development of the area's primitive communities, lies in mountainous territory near the borders of Kelantan and Perak States in Central Malaya and is accessible only by air. The Pioneer airstrip serving it has been cut out of the side of the 2,000ft hill on which the fort is sited and is the length of a rugby pitch.

When recent cloudbursts threatened to put the airstrip out of commission it was decided to introduce an extensive drainage system and divert a small mountain river. This involved lifting a railway system and earth-moving equipment—a total load of some 90 tons—into the fort.

Valettas of the Air Supply Force (Malaya) made the first drop (engineering equipment, fuel and basic supplies) on March 9; the following day Pioneers of No. 267 Sqn. lifted some 30 Royal Engineers into Fort Chabai and work on the ground began. On March 11, Whirlwinds of No. 155 Sqn. lifted 22 loads of equipment (including a large quantity of railway track and half a heavy tractor) into the fort and two days later a Freighter of No. 41 Sqn., R.N.Z.A.F., dropped the second half of the tractor and much other equipment.

When the work has been completed, in about six months, the Whirlwinds and Pioneers will be employed to bring the heavy equipment out of the fort.

R.A.F. Promotions

IN a recent Supplement to the *London Gazette*, the following promotions were promulgated:—

Wing Commander to Group Captain.—*Medical Branch:* J. R. Cellars; R. H. Pratt; C. C. Barker; J. C. Taylor; W. T. Buckle; E. S. Sidey.

Flight Lieutenant to Squadron Leader.—*Secretarial Branch:* M. E. Gardner; I. C. Murison, A.F.C.; E. J. Griffiths; W. A. Wilkinson; H. E. Boothby; J. W. A. Daley; P. W. Davidge; A. F. Cole; H. Lewis; J. Buckley; T. M. Armstrong; J. W. Gilvey; S. A. Durrant; R. A. Hudson; A. H. Cowton; E. W. F. Cooper; R. G. Huie; R. B. Weller; O. H. Speake; J. Bailey; W. B. Kersley; A. Platts; J. H. Low; D. L. A. Findlay; N. E. Bishop, A.C.I.S.

Flight Officer to Squadron Officer (W.R.A.F.).—G. G. Hall; B. Wilson.

IN BRIEF

No. 125 Sqn., Fighter Command, which has for some time been in process of disbandment, officially disbands on May 10.

* * * * *

A. Cdre. Asghar Khan, a Pakistani officer, is to take over command of the Pakistan Air Force from A.V-M. A. W. B. McDonald when the latter's contract expires in July.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns; the names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Flying-boat Floating Dock

From S/L. G. D. Castle, O.B.E. (R.A.F. retd.)

IT was interesting to see a photograph of the R.A.F. floating dock in the April 5 issue of *Flight* and to read that America has been claiming another doubtful "first."

I first tied up at the dock when it (or is it she?) was based at Portland in March 1929, while I was flying Southamptons with No. 201 Squadron, based at Calshot. She was used as a refuelling base by flying-boats and floatplanes. It is safe to assume that exhaustive trials had taken place at Felixstowe before this date.

The last time I saw the dock was at Sullom Voe, in the Shetlands, when I was flying Sunderlands with No. 204 Squadron. In June 1940 I put a Sunderland on the dock after the aircraft had been badly holed by enemy action. She was rumoured to have gone to Iceland and West Africa. Incidentally, one could occasionally purchase duty free cigarettes on board.

Dover, Kent. G. D. CASTLE.

Reach for the Earth

In a cavern, in a cavern,
Excavated deeper still,
Sit the airmen, now all chair-men
In the Air Force—what a thrill!

Once their fathers drove their bombers
Through the cu-nim; but for them
A finger itches o'er the switches
Ere they launch an I.B.M.

Alas for them, they are no pilots
Though a nobler job is found:
They're terrific, scientific,
Eighty metres underground.

Berks. A.H.W.

Flight Plans and the M.T.C.A.

From Maj. C. Draper, D.S.C.

A RECENT flight to Cardiff was my first legitimate cross-country for at least 14 years, but I cannot refrain from reporting the most fantastic "effort" on the part of the flying control people both at Croydon and Cardiff.

When I rang from the office of the Surrey Flying Club at Croydon to inform Control I intended to take off and fly to Cardiff, Pengam Moors, I was told I.F.R. was in operation and it was necessary for me to make out a flight plan, etc., etc.

In view of the really lovely cloudless sky this staggered me, but there is, nowadays, no alternative for the poor private pilot.

It is quite a walk from the club to Control, where I found a very polite lady who helped me to fill up a lengthy form in triplicate and sign a declaration, etc., etc., stating the time of departure, my destination and my E.T.A., also that I was to proceed down the "free lane" east of Kenley. All of which added to the time and cost of the flight.

Before reaching even a thousand feet I found the visibility *thirty miles.*

At Cardiff the performance of the M.T.C.A. official was equally fantastic. He rang me up from the aerodrome at Rhoose to ask why I had landed at Pengam Moors and not, in accordance with my flight plan, at Rhoose. I pointed out that I had never, in writing or by word of mouth to anyone, indicated that I would land at Rhoose. He as good as called me a liar and said they were just about to take overdue action because of my non-arrival.

I have been flying for 44 years, in an atmosphere I happen to know something about, and find it particularly humiliating to have to put up with this sort of thing.

London, W.1. CHRISTOPHER DRAPER.

[While no official comment is forthcoming from the Ministry of Transport and Civil Aviation, it is understood that (1) At the time (0830 hr) that Maj. Draper was asked to file a flight plan the visibility at Croydon was four miles. I.F.R. conditions under the new regulations are in force until visibility becomes five miles. (2) Just before Maj. Draper took off (0910) visibility had increased and it became V.M.C. [visual meteorological conditions] but as his aircraft had no radio there was no way of telling him that his flight plan could now be cancelled; and with the improvement in the weather the pilot had not done this himself. Therefore Croydon were in order in leaving the flight plan in force. (3) The flight plan as signed by Maj. Draper is understood to have been made out to Rhoose, although he may have intended it to be for Pengam Moors.—Ed.]

"Cinderella Transformation"

THE article with the above title, in *Flight* of March 15, and Sgt. Townend's letter in your April 5 issue, were of great interest to me, and show up an amazing coincidence.

Dakota KN550—the subject of the article describing the acquisition of the hulk and parts and their rebuilding into a civil airliner to be purchased by Aden Airways—was at one time flown by myself and my crew.

At the time I was a flight sergeant pilot with 271 Squadron, Transport Command, based at Down Ampney, near Cirencester, Glos, and at Broadwell, Oxon (with detachments to Northolt and to Kenley and Croydon during the building of Northolt's south-east/north-west runway).

The squadron was engaged on European supply and ambulance work at first, and then on the Python leave scheme to and from Bilaspur in India.

I believe that this aircraft was delivered to the squadron in April/May 1945, if not earlier, but the statement that it remained at Kemble until September 1945 is not quite correct. Until I ceased flying on medical grounds early in 1946, KN550 was continually based in the U.K., but operated to and from India on a 10/14-day cycle with slip crew.

It is very interesting to me to learn of her history after I left the squadron. The coincidence mentioned above occurs because I am now traffic superintendent of Eagle Aviation, Ltd., an associate company of Eagle Aircraft Services, Ltd., who did the rebuilding.

London, W.2. JOHN K. MAUNDER.

CLUB AND GLIDING NEWS

A HIGHLY successful rally on April 13, which had as its climax an "airborne farewell" to *Mayflower II* in Brixham harbour, is reported from the Plymouth Aero Club at Roborough. Prizes awarded to successful competitors were presented at a dance in the club-house on the evening of April 13 by Cdr. Alan Villiers, master of *Mayflower II*. They included the Pilgrim Fathers Trophy for the *concours d'elegance* (won by Mr. and Mrs. C. Roberts from Croydon in their Hillson Praga G-AEUT); the Mayflower Stone Trophy for the competitor flying the greatest distance to Roborough (B. Copley, from Yeadon, in Auster G-ANID); and the Mayflower House Rose Bowl for the best-prepared flight plan and best-kept navigation log (M. Looker, from Chivenor, in Auster G-AJXC).

The "airborne farewell" took place on Sunday morning, April 14, all the visitors and all aircraft of the Plymouth Aero Club participating.

WINNER of the Tiger Moth silver jubilee race at Sandown, Isle of Wight, on April 22 was Denis M. Hartas, a first officer with B.E.A. At the rally, held to celebrate the 25th anniversary of the granting of a C. of A. to the Tiger Moth, C. A. Nepean Bishop, hon. secretary of the Tiger Club, gave an aerobatic display and members of the British Parachute Club made a formation drop—the first by the club since pre-war days.

AN Auster Autocrat is shortly to be acquired by the North London Aero Club at Panshanger, Herts, bringing their total number of aircraft to four.

THERE is to be a rally at Lasham Gliding Centre during the Whit weekend (June 8-9) to give pilots a chance to practise for the National Gliding Championships, which are being opened by Prince Philip at Lasham on July 28 and continue until August 5.

ANOTHER gliding record was set up by Lt-Col. Anthony Deane-Drummond on April 19 when he flew his Skylark 3 from Lasham to Stow-on-the-Wold and then on to Castle Cary—a distance of 187 miles—in 6 hr 20 min, representing an average speed of 29.5 m.p.h. Subject to official confirmation, this established a British 300 km triangular speed record for single-seat gliders, and it follows Col. Deane-Drummond's 300 km British record on April 6 [reported in *Flight* for April 19] when he flew 215 miles in 4 hr 55 min (just over 40 m.p.h.).

Rotodyne Prelude

Pressure Jets and Noise Suppressors

The Rotodyne static-test rig at Boscombe Down. A single Eland and two rotor blades are first being tried. The fully equipped "cockpit" is in the shed in the foreground.

THE first flight of the Fairey Rotodyne is now within sight and the Fairey company has shown some of the equipment which has been, and is being, used to develop and prove the propulsive system and effective silencers for the tip-jets.

It was in 1947 that Fairey began research on jet propulsion of helicopter blades. Relatively early in the programme both ram-jet and pulse-jet were discarded in favour of the pressure-jet in which compressed air is fed to a burner unit at the blade tip, mixed with fuel and ignited. During succeeding years the many difficult problems besetting this form of tip propulsion have been successfully overcome. The Fairey Ultra-Light Palouste-powered machine has been flying successfully for some time; the Jet Gyrodyne has proved the technique of conversion from helicopter flight with tip-powered rotor to unloaded-rotor cruising and back again; and a large rig at Boscombe Down is even now testing the Eland turboprop/pressure-jet system of the first Rotodyne.

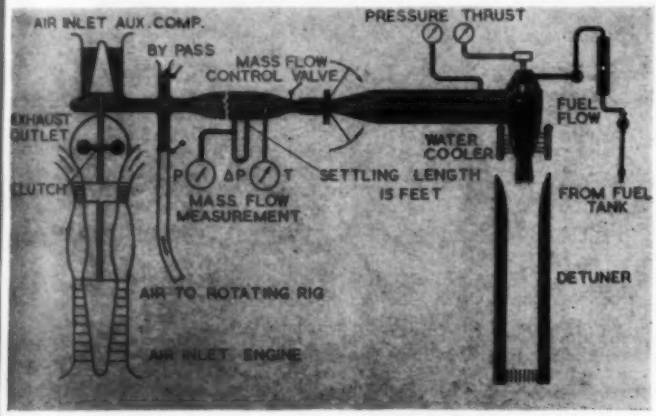
Research and test facilities have been steadily built up over the years until now Fairey have a comprehensive test facility at White Waltham. In 1951 a small static-test stand and a rotating rig suitable for Rotodyne chamber spinning tests were set up and a Rolls-Royce Dart with combustion chamber bleed was installed to provide air for static chamber tests. Two further Darts were used to supply a single-bladed rotating rig needed for developing the light-up, regulating, performance, cooling and stressing of pressure-jets. In 1953 the Gyrodyne rotor system was tested here; and at this time B.E.A. issued a new specification for a larger transport helicopter with a capacity of 40 seats instead of 25 seats. This led to the present Rotodyne size and configuration.

Further test rigs were set up in 1955 and 1956, and the twin-Dart compressor for the rotating rig was replaced by a supply from the Rotodyne Eland unit in the fixed test installation. Since work began, 800 hours' running have been completed on the later rigs for Gyrodyne and Ultra-Light chamber development, and about 520 hours have been put in on the new rigs for Ultra-Light and Rotodyne development, plus about 200 hours on noise-suppression development. In addition, White Waltham has waterflow rigs for visualizing flow in the tip-jet chamber.

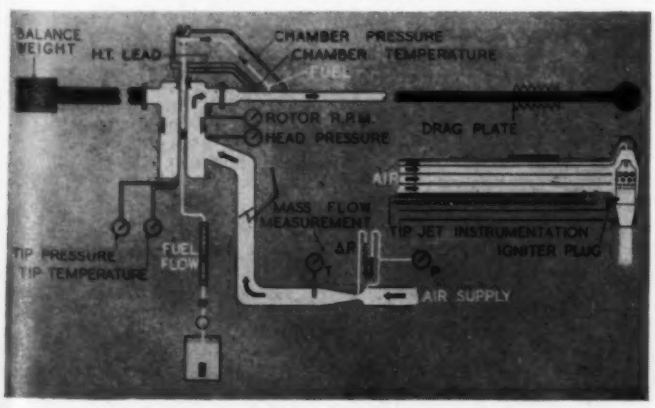
Two types of pressure jet have been developed. One is a flat unit housed radially in the tip of the Ultra-Light blades, the efflux from which is turned through 90 deg to provide tangential thrust. Considerable work was required in developing burners and liners for this 60 lb-thrust unit. The advantage of the arrangement lies in the fact that the burner unit is contained within the profile of the blade.

For the Rotodyne the air supply, passing through three tubes along the blade, is led directly on to the side of the combustion liner and there turned through 90 deg, mixed with fuel and ignited to produce direct rearward thrust from a faired cylindrical pressure-jet unit. Such a unit is easier to manufacture and is better able to withstand internal pressure and heat; but there are pressure-drops across the liner and it is difficult to obtain a symmetric flow- and burning-pattern from the asymmetric air supply.

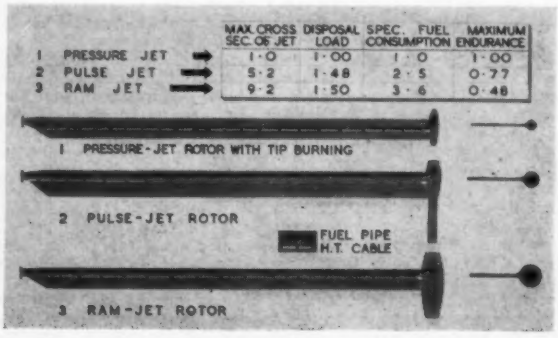
Though the Rotodyne chamber is approximately the size of a Ghost combustion chamber, the combustion intensity is three



The static pressure jet testing layout at White Waltham, above, uses a Rotodyne Eland to supply compressed air. This air is diverted to the rotating rig (schematically illustrated below) for spinning tests. The drag-plate prevents the fixed-pitch blade overspeeding.



Comparative size and performance of pressure-jet, pulse-jet and ram-jet when used for rotor tip-propulsion. The Fairey company discarded the last two in favour of the first.


MAX. CROSS SEC. OF JET
DISPOSAL LOAD
SPEC. FUEL CONSUMPTION
MAXIMUM ENDURANCE
1 PRESSURE JET 1·0 1·00 1·0 1·00
2 PULSE JET 5·2 1·48 2·5 0·77
3 RAM JET 9·2 1·50 3·6 0·48
1 PRESSURE-JET ROTOR WITH TIP BURNING
2 PULSE-JET ROTOR
FUEL PIPE
H.T. CABLE
3 RAM-JET ROTOR

The Jet Gyrodyne which proved the operating technique and method of conversion from helicopter to autorotative flight for the Rotodyne.

ROTODYNE PRELUDE . . . .

times that of the average turbojet, since much richer mixtures are used. Efflux temperatures of 2,000 deg C are obtained, and thrusts of about 1,200 lb per Rotodyne unit are expected. The mass flow through a Ghost chamber is about the same as that through the Rotodyne pressure-jet, but the heat release of the latter is about four times greater. The total fuel consumption of the complete Rotodyne rotor at take-off will be about 1,000 gal/hr compared to about 750 gal/hr for a complete Ghost. This is not exorbitant, because the Rotodyne pressure-jets would be used only during take-off and landing. During these phases, rotor r.p.m. would be held substantially constant at about 153 r.p.m. During cruising at 135 kt, with the rotor partly unloaded, the r.p.m. would drop to about 130 and the tip jets would not be in use. Faireys estimate an initial tip-jet unit life of about 50 hours, increasing to between 200 and 300 hours at a later date. Since only 10 per cent of total flight time is envisaged for tip-jet propulsion, the installed life of each pressure-jet will be about 10 times the actual operating life of the tip jet unit.

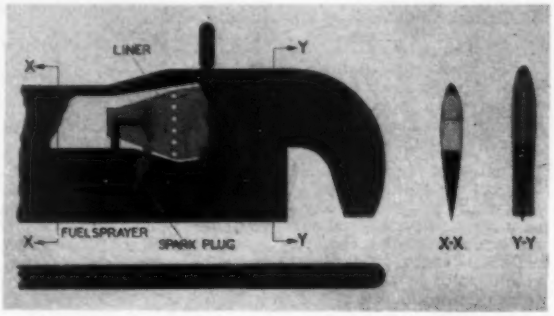
One of the great achievements of the Fairey team is the successful design of suitable pressure-jet liners. In this they are well ahead of other companies. Another successful development in the field is the effective tip-jet lighting mechanism which, based on a Napier-developed two-Joule 500 V, fast-sparking ignition system, can light the tip jet during mass flows very considerably higher than any which have been attempted for the re-lighting of turbojets. The design of this special lighting-up system in fact exercised the Fairey design team quite considerably in the preparation of both Gyrodyne and Rotodyne systems. Whereas in the Gyrodyne the ignition system is operative throughout the use of the tip jets, only a 20-second ignition burst is used for the Rotodyne units; at full air supply, light-up is almost immediate.

The Rotodyne propulsion system is, of course, based on two Napier Elands arranged to drive either a propulsive airscrew at the forward end of the engine or, through a clutch, a ten-stage axial air compressor located aft of the bifurcated engine efflux. For the take-off phase, the power of the Elands is devoted to driving the compressors so that these supply air to the tip-jet units. A flow of fuel to these units is regulated and, after being atomized in the flame tube, is ignited to provide thrust for the otherwise free-wheeling rotor. Full helicopter-type rotor control is used in the helicopter flying phase at take-off, hovering and landing. The initial rate of climb in this condition is estimated at some 1,500ft/min. At a suitable time the power of the Elands is progressively diverted to the propulsive airscrews, the tip jets being phased-out at the same time so that, when conversion is complete, total propulsive effort is derived from the Eland airscrews and lift is shared by the partially unloaded rotor and the Rotodyne's short wings. Flight control is then achieved with the assistance of aerodynamic control surfaces on the tail and wings.

It is to test this complete power system that the very large rig at Boscombe Down has been set up. There, the actual rotor head of the first Rotodyne is mounted on a large steel structure, together with the wing and Eland power units, all set in their correct dimensional relationship to each other. A cockpit unit containing test instrumentation and the actual pilot's control position is housed in a small wooden shed, again set in dimensionally accurate relationship to the rest of the system. At the moment, one Eland and two of the four rotor blades are being used.

The power of the rotor with tip-jets on is regulated either by changing the power input into the compressor section (in the case of the Ultra-Light) or by movements of the air-supply valve (in the Jet Gyrodyne and Rotodyne). Both types of control are connected to the collective-pitch lever with an override control in the form of a twist-grip on top of this lever. Fuel is supplied to the tip jets by a low-pressure pump which raises it from the tank to the rotor head, whereupon centrifugal force builds up a pressure as high as 1,000 lb/sq in at the burners. Fuel supply and air/fuel ratio are automatically adjusted by a special regulator unit.

A most important programme, begun by Faireys in 1952, has been that of suppressing the noise of the tip jets. A great number of differently-shaped orifices for these units has been tried, with the result that noise attenuation of some ten decibels has now been achieved for a thrust loss of only five per cent. This thrust loss could be restored by injecting extra fuel for only an insignificant increase in noise level. Though such a power loss would be serious for a turbojet system, it is not critical for the short operating periods envisaged for the Rotodyne. The noise of the Rotodyne tip-jet units has now been reduced from 105 db to about 95 db. Below this point further reduction does not offer great advantages, since the rotor noise itself is of about this value.



The radial flame-tube of the pressure jet used in the Fairey Ultra-Light helicopter. The unit is shaped to fit inside the blade profile, and special liners and fuel spray had to be developed for it.

Extensive measurements have been made and it is hoped that the noise of the Rotodyne at take-off can be reduced to a level comparable with that of a tube train. The high rate of climb on take-off will further help to reduce noise nuisance.

Experiments have now shown clearly the requirements for silencers for this kind of application, and further work is in hand to increase performance. It has been found that the best silencing characteristics can be achieved by channelling the efflux flow through a series of slots spaced as far from each other as possible. Optimum slot-widths have been arrived at, and the configuration of the latest silencer is a sixteen-pointed star formation of radial slots. The efflux area is substantially the same as that of the original circular nozzle and the area of the whole silencer is therefore rather larger than that of the old nozzle. Subsequent development is aimed at reducing the resulting drag still further.

To carry out all this work, Fairey have to a certain extent made use of the facilities of the National Gas Turbine Establishment at Pyestock, but they have also developed considerable new instrumentation for such purposes as that of measuring the thrust of a pressure jet while it is rotating at the end of a blade.

By the time the Rotodyne flies it will have behind it some ten years of intensive pressure-jet development and much practical experience of operating technique.

HAWKER SIDDELEY AND BRUSH

COMMENTING recently on the proposed Brush - Hawker Siddeley merger [mentioned in a news-item on p. 534 of *Flight* last week] the chairman of the Brush group, Mr. Geoffrey Eley, said he had been aware ever since he joined the Board three years ago of restraints imposed on the group's growth by under-capitalization. The Hawker Siddeley group would provide the financial backing required for expansion in the field of nuclear power, and it was fortuitous that their ideas and those of Brush in that field were "very much alike". Adding that Hawker Siddeley's "commanding position in Canada" held "great interest" for the Brush group, Mr. Eley said the Hawker Siddeley offer was "the best possible proposal" for the Brush Group.

In his comments on the proposed merger [as briefly reported last week] Sir Roy Dobson, Hawker Siddeley director, said: "We feel that the Brush group offers us an exceptional opportunity to link our world-wide facilities with theirs, to provide Brush with the financial resources required for their development programme and . . . to give our stockholders and theirs a really good deal.

"We are vitally concerned in the development of nuclear energy and the means of distributing power from it. By merging our technical and financial resources with Brush we can take a further big step that will be all-important in the years to come."

Idlewild, New York—the world's busiest international airport.

WORLD CIVIL AVIATION

A "FLIGHT" SPECIAL REVIEW

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WE present this special issue at a time when the future of aviation in the affairs of men is seen more distinctly than hitherto. Britain's new defence policy has highlighted two paramount truths: that peace may be maintained (or broken) by the guided missile, and that the richest rewards—for industry, operator and indeed for mankind—will be found in the pursuit and expansion of air commerce. We presented our review of the world's missiles on December 7; here we study more peaceful uses of aviation.

THE TRANSPORT AIRCRAFT MARKET: SOME PROPHECIES AND PROPOSALS

Where do we go from here?

By J. M. RAMSDEN

HOW often in the air transport business does one not hear it said: "The next few weeks will be crucial"—or words to that effect? For aircraft manufacturers the next few weeks are always crucial. There is no business in the world (except perhaps that of feminine fashions) in which the trend moves so fast, or in which designers may wake up any morning to find themselves out of date. It might be possible to find in other forms of commerce a market more difficult to judge; it would be difficult to discover one in which the price of failure is so dear or the reward of success so high.

Gone are the days when an aircraft market survey was nothing more than a board-room hunch, and when a new design could be in service in six months for an outlay of £10,000. Market research has become the rock—or the sand—upon which a new project is built. It is like the weather forecast in its limitations—but no firm will embark on a project costing £10m a year for anything up to five years without first appraising the likely market as carefully as judgment and experience permit. This may sound obvious: yet it was only a few years ago that British civil aircraft manufacturers had but hazy notions of the size of the market for which they were building.

The industry's products are typical of those by which Britain, a highly developed country with limited natural resources, has to earn its living in the world. The nation earns half its income by applying its technological skill to the fashioning of imported raw materials into engineering products such as aircraft, ships, motor vehicles, machine tools, electrical equipment, nuclear reactors, and so forth. Of these, aeroplanes are a synthesis of more branches of technology—from their instruments to their aerodynamics—than any other product, and they accordingly represent a more highly rewarding return per pound of raw material imported. And the capacity-hungry airlines of the world are collectively prepared to pay out, during the next 20 years, hundreds of millions for new transport aircraft of every category. It is in the light of these facts that Britain's aircraft industry, and the nation, must consider whether it can afford to ignore even one single category of transport aeroplane.

There is another very good reason why it must thus consider its future: the industry must now learn how to live with drastically diminished defence contracts. The effect of Mr. Sandys' sweeping changes upon the spending of his colleague the Minister of Supply will very soon be felt in most sections of the aircraft industry. The axe has been clearly seen poised for a year or more; but a blow is no less a shock for being expected. It will leave the industry, potentially the nation's most valuable export asset, shorn of much of the military production earnings and research contracts which motivate it, and (as before) with only a small home market for its transport aircraft. Its commercial position in relation to the United States industry, against which it must measure itself, must now be critically re-assessed.

What is the outlook for tomorrow? To give the question a keener edge, what are the commercial prospects for British aircraft manufacturers at this point in time—nearly half-way through the year 1957?

It is clear that 1960 will be the year in which the world's big airlines will scramble up on to what the Douglas company have called the next "speed plateau" of air transport, the 600 m.p.h. level of high-subsonic pure-jet travel.

The present plateau of 200-300 m.p.h. travel, which began in about 1940 with pressurized, four-engined transports developed from the DC-4 and the L.49 Constellation, will have extended over 20 years. It seems probable for market planning purposes that the airlines will work on the new 600 m.p.h. plateau for the next 20 years, until the time comes in about 1980 for the airlines to scramble up on to the next plateau—the realm of supersonic flight.

Such a view of future air commerce can be acceptable only as a broad generalization, for there will be large potential markets between 1960 and 1980 for turboprop transports to work at speeds below the level of the 600 m.p.h. plateau. But any planning for the future should take account of the high probability that the largest markets will be for jet transports—long-haul, medium-haul and short-haul. For better economics or for worse, the 707 and the DC-8 have set the trunk-route transport fashion of the future. Already the fashion looks like spreading to the medium-distance and shorter-stage routes. Even the large and lucrative executive-transport market, which buys twice as many aircraft as all the world's airlines put together, is entering the jet-race.

So far, the British industry has not decided on a single contender for the 600 m.p.h. pure jet market (discounting the D.H.118). Can it afford to delay any longer?

If it is accepted that this is the market for which jet transports of all shapes and sizes will be required in large quantities in the sixties and seventies, further delay might lead to the market's irretrievable loss. The jet tide is rising, and Britain's industry can retreat before it, try to fight it back with turboprops, or rise with it. Retreat would be bad business. A fight of economic ideologies with turboprops might result in eventual (though not immediate) engulfment by sheer weight of numbers. The wisest course would be to rise with the tide.

Those who say that the airlines have gone overboard by ordering so many big jets overlook the fact that speed is the dominating and pace-setting influence in air transport. It is, say the jet-critics, economics which must come first—otherwise the public will not be getting a fair deal from the airlines. Why, they ask, should not the passenger and the air transport user be able to take advantage of the superior ton-mile costs which even the jet protagonists must honestly concede to the turboprop in every range-category? The answer is likely to be a that's-too-bad shrug of the shoulders, and another order for jets.

The impression is inevitably formed of two entirely different characters courting the airlines' favours. One is the quiet, well-mannered, thrifty turboprop—homely and unglamorous, but utterly to be trusted to bring home the bread and butter. The other is the blustering, fast-living, prodigal jet—attractive and glamorous, and sweeping the airlines off their feet.

Perhaps the future is being slanted too heavily in favour of the jet? If by the future we mean the next six to eight years, this contention could be upheld. Turboprop transports will continue to be in demand in that period—not only because of the need for their capacity, but also because they will not be too sorely challenged by jet competition on the short-haul (up to 1,000 miles) and medium-haul (1,000 to 2,000 miles) routes. But at the end of that period—say by 1963 or 1964—when the long-haul trunk route operators have the big jets well bedded in, the airlines will be ready for large-scale widening of the plateau to accommodate new

jet transports designed for the medium and short-stage routes.

Two distinct types of transport will be needed. The medium-range jet, weighing between 170,000 lb and 200,000 lb, will be in demand first. Already Convair have secured orders for 44 of their 880s. Boeing, too, have now made the medium-range 717 official—an unusual step which suggests the imminence of orders. Douglas have not yet publicly announced the existence of the DC-9 medium jet project, but its influence has been strongly felt.

The short-haul jet, weighing between 100,000 lb and 130,000 lb, will follow. Only murmurs about projects for this category have been heard: one was the Boeing 727, shelved for lack of a suitable powerplant, and the other is the Bristol 200. The short-haul class of jet will be the last to appear on the routes because it will be technically the most difficult to achieve: its work will be done on the short-haul, 300-mile to 1,000-mile sectors where the jet's superior speed confers the least economic benefits. And the key to its feasibility is the engine, which must be of a size and economy for the achievement of which there has been no military incentive. Nevertheless, the short-haul jet will be in demand, and if the British industry does not build it first the American will.

The estimate of the future has been slanted in favour of the jet only after careful weighing of the signs and portents. He would be a bold man who could say that the jet *v* turboprop controversy had been neatly resolved, to give the jet the 1970 place in the sun and the turboprop the humdrum chores off the main competitive highways. The demarcation cannot yet be defined; and if the differential pricing of jet and turboprop travel ever comes to pass—a crucial subject which we discuss on pages 583 to 584—the two forms of propulsion will have a place in the sun together, the travelling public will be given a fair deal, and everyone will be happy.

Britain already has a healthy brood of turboprop transports—the short-haul Viscount, Accountant and A.W.A. Freightliner; the medium-haul Vanguard; and the long-haul Britannia. Its industry is contributing also, to the tune of 30 per cent of its value, to Holland's local-service Fokker Friendship. All these transports, with the exception of the Accountant and A.W.A. projects, have succeeded in penetrating the North American market, hitherto the unchallenged preserve of the U.S. industry. And for those who want to extend the life of their piston-engined fleets, Napier will do turboprop-conversion business with the Eland. It would not be complacent to suggest that Britain's position as a turboprop trader is one of great strength; the nation has something to offer for every category of turboprop transport. But its industry has no 600 m.p.h. jet transport of any category on the stocks.

For the industry's planners, who must decide now what is to be on the shop floors from the mid-sixties, the jet *v* turboprop controversy is, we suggest, resolved. The industry's future as a major exporter of first-line transports, and therefore as a national asset (forget prestige), depends on whether it seizes now the opportunity to build a medium jet transport and a short-haul jet transport for service in 1963 or 1964.

Such transports have existed as projects on the boards of de Havilland, Vickers and Bristol designers for exactly one year now. The time is ripe for action: B.O.A.C. will need a medium jet of the Convair 880 type for its Empire routes, to replace its Comet 4s and to supplement its trunk-route 707s—and such an aircraft will be needed by 1963 or 1964. And B.E.A. needs a short-haul jet for its prime international sectors at about the same time.

Why the delay? There appear to be two main reasons: (1) Because neither Corporation, each of which must obviously be the sponsoring customer, had not—until very recently at any rate—made up its mind as to its exact requirements. (2) Because even with the security of an initial order no firm would dare to design, develop and tool either project at a cost of anything up to £20 million without support from the Government—who, no less than the manufacturers, want to be sure that the export market-survey looks promising.

These appear to be the two main reasons why the industry is still static so far as high-subsonic short-haul and medium jet transports are concerned. The solution to (1) rests with B.E.A. and B.O.A.C.; clearly it is in their interests as well as the industry's quickly to decide upon their requirements. There is no reason why B.E.A.'s short-haul jet or B.O.A.C.'s medium jet should be anything but exportable: but it is hard to sell foreigners on projects which are not yet accepted by home consumers. The solution to (2) lies with the Treasury, who need convincing of big returns on a further £40 million or £50 million investment in an industry whose commercial record in this respect has not been good, and at a time when economy in expenditure is the order of the day.

Consider, then, the extent of the possible market for the medium jet and the short-haul jet between 1960 and 1980—postulated as the era of the high-subsonic speed plateau. For good measure we shall assess the long-haul jet market also.

Assume that scheduled world air traffic grows at an average annual rate of 10 per cent between now and 1980. This is six per cent less than the average hitherto: the slower rate is assumed to allow for possible saturation of the market, and to err on the conservative side. At this rate of expansion rather more than 660,000 million tonne-km (to use unambiguous units) of traffic—passengers, cargo and mail—will be carried between 1960 and 1980. It is reasonable to expect from knowledge of the past that one-third of this traffic will be transported by aircraft designed for short-hauls (say up to 1,000 miles), one-third by medium-haulers (designed for, say 1,000-2,000 mile stages), and the remaining third by long-haulers (for, say, 2,000 mile stages and above). This gives us a capacity requirement (assuming as in the past a total 60 per cent load factor for passenger, mail and cargo) of about 370,000 million tonne-km for each category of transport—short-haul, medium-haul and long-haul—between 1960 and 1980.

It is now necessary to make a guess at the *proportion* of each which will be obtained by jets. It can only be a guess; but the following tables, which are divided into the two separate decades of the period under review—the sixties and the seventies—are proffered as being reasonable estimates of the likely shares. Allowance is made in the 1960-1969 table for the progressive complete attrition of piston transports, and for the steady build-up of short-haul and medium-haul turboprops between 1960 and the mid-sixties. In the 1970-1979 table, the creed of the jet—the plateau, or what you will—is assumed to have become well established, but the adoption of differential pricing of jets and turboprops has been assumed, giving the turboprops a larger share of the passenger traffic than they might otherwise obtain in that era. (They will, of course, be carrying the major proportion of freight in the seventies.)

Proportions of Jet Capacity Required (millions of tonne-km)
Sixties (1960 to 1969)

Short-haul capacity (one-quarter to jets)	Medium-haul capacity (one-third to jets)	Long-haul capacity (two-thirds to jets)
25,500	34,000	68,000

Seventies (1970 to 1979)

Short-haul capacity (one-half to jets)	Medium-haul capacity (three-quarters to jets)	Long-haul capacity (three-quarters to jets)
132,500	198,750	198,750

The combined result of the above tables, to cover the whole 20-year period 1960 to 1980, is as follows. (It shows that about 60 per cent of total required capacity will be provided by jets.)

Jet Capacity Required, 1960-1979 (million tonne-km)

Short-haul	Medium-haul	Long-haul
158,000	232,750	266,750

We now have a basis for estimating the numbers of jets likely to be required between 1960 and 1980. Typical work capacities for each class of jet transport might be as follows:—

Typical Jet Transport Unit Work Capacities

	Short-haul	Medium-haul	Long-haul
Capacity payload (tonnes) ...	9.1	11.3	17.25
Typical block speed (km/hr) ...	650	700	750
Typical annual utilization (hr) ...	2,200	2,600	3,000
Unit annual work capacity (million tonne/km)	13	21	39

From the two foregoing tables, and assuming an average ten-year working life for each transport, we arrive at the conclusion that, between 1960 and 1980, the airlines will need about 1,200 short-haul jets, 1,100 medium-haul jets, and 700 long-haul jets.

Today the factories are full, as witness this Viscount production scene. What of tomorrow? The text discusses possible future occupants of the shop-floors of Britain's air transport builders.

WHERE DO WE GO FROM HERE? . . .

So far they have ordered no short-haul jets, only 44 medium jets, and 240 long-haul jets.*

The conclusion is clear: the potential market for short-haul and medium jets appears, on a conservative estimate, to be very large—thus providing the answer to point (2) raised earlier.

Furthermore, the market for long-haul big jets is large also. Are the remaining 460 orders going to go to the 707 and DC-8 and their developments, Britain having dropped out of the running as the supplier of major trunk route equipment for the next 20 years? Obviously, it would be fatuous to produce now, for delivery two or three years after the 707 and DC-8, a transport of similar design. It would be a waste of money, even though it might enable B.O.A.C. to operate British jets under the British flag. But the big-jet market cannot be ignored, nor can the development of laminar flow and ducted fans—either of which could produce remarkable gains in economy in aircraft of this class. The danger is that, under the new economic policy, vital basic research of this type may be curtailed as unlikely to be of future military value.

*These figures do not include orders for Comets and Caravelles.

Conclusions: It comes to this. The nation's aircraft industry, if it is to retain its present size, must henceforth trade largely in the world transport market. To do this successfully, and because success will make it a most valuable export asset, the industry must receive more than the support of the Corporations. Its basic research work—into laminar flow, VTOL, jet flaps and so forth—must not be allowed to atrophy from reduced military significance: only upon such expensive foundations can future transports be built to compete. And the home market must be enlarged (1) by giving the private airlines greater opportunities to gain a share of expanding international traffic, and (2) by giving meaning to the Defence White Paper's reference to a home-based "central reserve" with global mobility—in other words, by enlarging R.A.F. Transport Command.

The industry is qualified to tackle any kind of transport aircraft, and its greatest strength lies in its engines. Its turboprop transport activities may be considered sound and comprehensive, and its helicopter prospects—though regrettably not encouraged by domestic operations—may be regarded as promising. But it has yet to offer any class of 600 m.p.h., high-subsonic jet transport to a market which, if all the portents are correct, will absorb such aircraft in large numbers during the next two decades.

THE AIRLINES' SHOPPING LIST

Correct to April 25, 1957, excluding options but including certain government and corporate orders

Aircraft	Variant	Powerplant	Airlines (listed in order of purchasing)	Total
Douglas DC-8	Overseas or Long-Range	Pratt and Whitney JT4	PanAm, 25 (Dec. 1959); United, 15 (May 1959); K.L.M., 8 (March 1960); Eastern, 18 (May 1959); J.A.L., 4 (1960); S.A.S., 7 (1960); Panagra, 4 (early 1960); Swissair, 3 (first half 1960, the third in 1961); U.A.T., 3 (1960); T.A.I., 2 (1960)	120
	Domestic	Rolls-Royce Conway	T.C.A., 4 (early 1960)	
	Domestic	Pratt and Whitney JT3	United, 15 (May 1959); National, 6 (Midsummer 1959); Delta, 6 (June 1959)	
Boeing 707	120	Pratt and Whitney JT3	PanAm, 6 (Dec. 1958); American, 30 (operation on June 15, 1959); Continental, 4 (May 1959); T.W.A., 8 (April 1959); Qantas, 7 (Type 138, May to September 1959)	120
	220	Pratt and Whitney JT4	Braniff, 5 (Oct. 1959); Sabena, 4 (Dec. 1959)	
	320	Pratt and Whitney JT4	PanAm, 17 (March 1959); Air France, 17 (Nov. 1959)	
	420	Rolls-Royce Conway	Lufthansa, 4 (Summer 1960); Air India, 3 (early 1960); B.O.A.C., 15 (1960)	
Bristol Britannia	102	Proteus 705	B.O.A.C., 15 (current delivery)	66
	250	Proteus 755	R.A.F. Transport Command, 13; M. of S., 3	
	300-series	Proteus 755	M. of S., 1; Northeast, 5 (Oct.-Nov. 1957);	
	310-series	Proteus 755	B.O.A.C., 18 (from May 1957); El Al, 3 (from May 1957); C.P.A.L., 6 (Sept. 1957-Jan. 1958); Hunting-Clan, 2	
Douglas DC-7C Seven Seas	—	Wright R-3350	PanAm, 33 (current delivery); Swissair, 4 (current); S.A.S., 14 (current); Sabena, 10 (current); Braniff, 7 (current); B.O.A.C., 10 (current); K.L.M., 10 (1957); Northwest, 11; R.E.A.L., 3; Panair, 4; T.A.I., 2; Alitalia, 4; C.M.A., 4; J.A.L., 4	120
Lockheed L.1649A	—	Wright R-3350	T.W.A., 25; Air France, 10; L.A.I., 4; Lufthansa, 4	43
Convair 440 Metropolitan	—	Pratt and Whitney R-2800	R.E.A.L., 10; S.A.S., 11; Finnair (Aero O/Y), 3; Sabena, 12; Swissair, 11; Iberia, 5; Continental, 3; National, 6; Delta, 8 (Jan. 1957); Eastern, 15 (May 1957); Braniff, 5; Alitalia, 2; Jugoslavia (JAT), 1; Lufthansa, 12; Air Carrier Service, 2; R.A.A.F., 2; U.S.A.F., 6; Corporate customers, 11; Karhumaki Airways, 1 (June 1957); Ansett, 3 (June 1957); Italian A.F., 1 (July 1957); Cruzeiro do Sul, 4 (Oct. 1957)	134
Sud-Est Caravelle		Rolls-Royce Avon RA.29	Air France, 12 (late 1958 to late 1960)	12
de Havilland Comet	4	Rolls-Royce Avon RA.29	B.O.A.C., 19 (mid-1958); Capital, 4 (Nov. 1958)	33
	4A	Rolls-Royce Avon RA.29	Capital, 10 (June 1959)	
Lockheed Electra		Allison 501	Eastern, 40 (Oct. 1958); American, 35 (Jan. 1959); Braniff, 9 (May 1959); National, 23 (April 1959); K.L.M., 12 (Sept. 1959); Western, 9 (late 1959); Allison, 1; Loftleidr Icelandic Airlines, 2; Braathens, 1	132
Vickers Viscount	700 & 800 series	Rolls-Royce Dart	*See list below*	367
Vickers Vanguard	950 series	Rolls-Royce Tyne	B.E.A., 20 (March 1960); T.C.A., 20 (Aug. 1960)	40
Convair 880		General Electric CJ-805	T.W.A., 30 (late 1959); Delta, 10 (1959); Transcontinental, S.A., 4	44
Fokker F.27 Friendship	Fokker-built	Rolls-Royce Dart	K.L.M., 2; Aer Lingus, 5 (late 1958); T.A.A., 6 (early 1959); B.K.S. Air Transport 2; Dutch Government, 1; "an Italian company," 1; Braathens, 3; Australian Government, 1; Iranian Oil, 2; Butler Air Transport, 5	76
	Fairchild-built		West Coast Air Lines, 4 (Nov. 1957); Mackey, 2 (Oct. 1957); Frontier, 2 (Oct. 1958); Bonanza, 3 (Jan.-March 1958); Piedmont, 12 (late 1957); General Tire and Rubber, 1 (1958); Continental Can Co., 1 (1958); Quebecair, 2 (early 1958); other U.S. executive versions, 4; Aerovias Ecuatorianas, 1 (early 1958); Northern Consolidated, 3; Aerolineas Argentinas, 10; Southwest Airlines, 3	
Handley Page Herald		Alvis Leonides Major	Queensland Airlines, A.N.A., and Lloyd Aero Colombiano—29; Air Kruise, 6	35
Frye Safari		Wright R-1300 or Pratt and Whitney R-1340	Cruzeiro do Sul, 10 (end of 1957); Catalina Airlines (California), 2	12

Vickers-Armstrongs Viscount (all models). The following list of confirmed orders accounts for 367 aircraft, as follows: B.E.A., 26 V.701 (Dart 505), 1 V.701 (Dart 506), 24 V.802 (Dart 510), 14 V.806 (Dart 520); B.W.I.A., 4 V.702 (Dart 506); Aer Lingus, 4 V.707 (Dart 505), 3 V.808 (Dart 510); Air France, 12 V.708 (Dart 505); T.A.A., 6 V.720 (Dart 505/6), 1 V.720 (Dart 506), 5 V.756 (Dart 510), 2 V.816 (Dart 525); Indian Government, 1 V.723 (Dart 506), 1 V.730 (Dart 506); T.C.A., 15 V.724 (Dart 506), 23 V.757 (Dart 506); Hunting-Clan, 3 V.732 (Dart 506), 2 V.759 (Dart 510)*; Pakistan Government, 1 V.734 (Dart 506); Iraqi Airways, 3 V.842 (Dart 510), 1 V.773 (Dart 506); Fred Olsen, 2 V.736 (Dart 506), 4 V.779 (Dart 510); Canadian Government, 1 V.737 (Dart 506); Misrair, 3 V.739 (Dart 506); Braathens, 1 V.742 (Dart 510); Capital, 3 V.744 (Dart 506), 72 V.745 (Dart 510); Butler Air Transport, 2 V.747 (Dart 506); Central African Airways, 5 V.748 (Dart) 510); L.A.V., 3 V.749 (Dart 506); B.O.A.C. 8 V.754 (Dart 510), 4 V.772 (Dart 506); Hong Kong, 2 V.760 (Dart 510); U.B.A., 3 V.761 (Dart 510); Hughes Tool Co., 1 V.763 (Dart 510); U.S. Steel Corp., 3 V.764 (Dart 510); Standard Oil, 1 V.765 (Dart 510); Indian Airlines, 10 V.768 (Dart 510); K.L.M., 9 V.803 (Dart 510); Transair, 2 V.804 (Dart 510); New Zealand N.A.C., 3 V.807 (Dart 510); Continental, 15 V.812 (Dart 525); Air Austria, 4 V.803 (Dart 510); South African Airways, 7 V.813 (Dart 525); Iranian Airways, 3 V.782 (Dart 510); Lufthansa, 9 V.814 (Dart 525); Philippine Air Lines, 2 V.784 (Dart 510); L.A.I., 10 V.785 (Dart 510); South African Government, 1 V.781 (Dart 510); Pakistan Air Lines, 3 V.815 (Dart 525); Cubana, 3 V.755 (Dart 510). 4 V.818 (Dart 525); Lloyd Aero Colombiano, 3 V.770 (Dart 510); Brazilian Government, 1 V.770 (Dart 510); P.L.U.N.A. 3 V.770 (Dart 510); Niarchos, 1 V.819 (Dart 525); Black Lion Aviation, 1 V.820; Eagle Aviation, 3 V.821 (Dart 525).

*The 732s leased to M.E.A., the 759s sold to Icelandair.

Three-dimensional Dilemma

TRAFFIC CONTROL: CIVIL AVIATION'S BIG PROBLEM

By A. T. PUGH and C. M. LAMBERT

TO talk to pilot, operator, manufacturer or control officer about air traffic control produces a common reaction. It may be a despairing groan or an indignant explosion; it is unlikely to be favourable. In an era of traffic expansion unprecedented in commercial history, with non-stop transatlantic travel a reality and with large increases in carrying capacity and cruising speeds only a short step ahead, something is obviously sadly awry with the mechanism of air transport's operational control. "Four near-misses every day" is a chilling and oft-quoted traffic statistic of 1956; and every passenger, every pilot, every operator knows that peak traffic periods on busy air routes are resulting in longer and longer delays. What—shed of all but its essentials—is the problem? And how can a solution be reached?

To recognize the core of the problem it is perhaps necessary to take a fresh look at the route-pattern of the world's air traffic, for at first sight there is plenty of air for a million times the number of aircraft flying today. But air traffic routes are not random, and most of the airspace is rarely used; the majority of the traffic flow follows the inter-city courses, with large centres in highly developed areas annexing the largest share. And this condensation of air traffic into intricate webs of dense routes makes it—because the areas to be supervised are more compact—*easier* to control; an ironical situation that has been called "the paradox of proximity." It would assist the control problem, of course, if the third dimension unique to air travel—altitude—could be better used within the airspace that is controlled; but just as the economics of air transport demand shortest-distance travel, so is the air traffic controller tied by the performance of the aircraft under his direction.

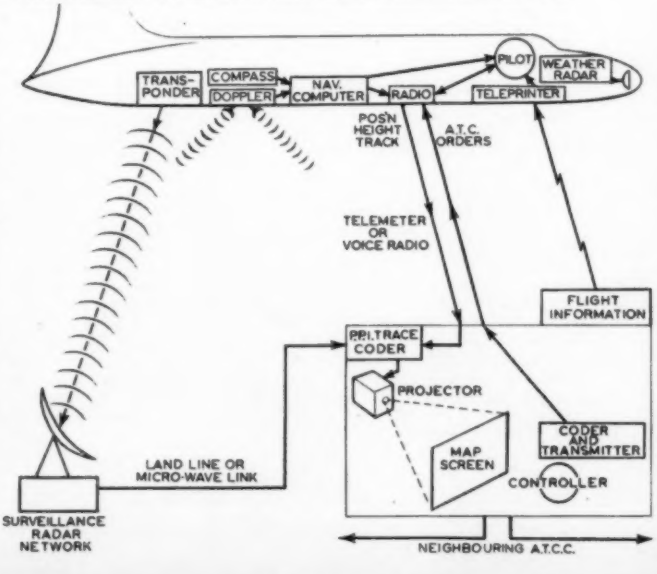
The methods currently employed for A.T.C. seem, at a first look, reasonable enough. If an aircraft wishes to fly airways in weather conditions which are below prescribed minima, a flight plan is filed before departure, periodic position reports are transmitted from the aircraft, and the A.T.C. officer maintains adequate separation between aircraft in the sector under his control by correlating the reports he receives and issuing altitude and heading instructions.

In practice this procedure is inadequate to meet the demands of heavy air traffic. It is incapable, say the Guild of Air Traffic Control Officers, "not only of handling existing traffic, but, more serious still, of being developed or extended." A flight plan may be filed; but there may be any number of good reasons—or no reason at all—why it is not flown. Reported positions obtained from cockpit instruments may not be accurate: present international standards based on these reports demand separations of 1,000ft vertically and as far as 40 miles longitudinally—and may even be *deliberately* inaccurate; a situation explained by the human propensity for cutting corners and the overwhelming cockpit workload of the short-haul pilot. The necessary position report may well be required simultaneously with the receipt of a weather broadcast, operation of the radio compass, monitoring of the fuel system, and the listening watch for the aircraft's call sign.

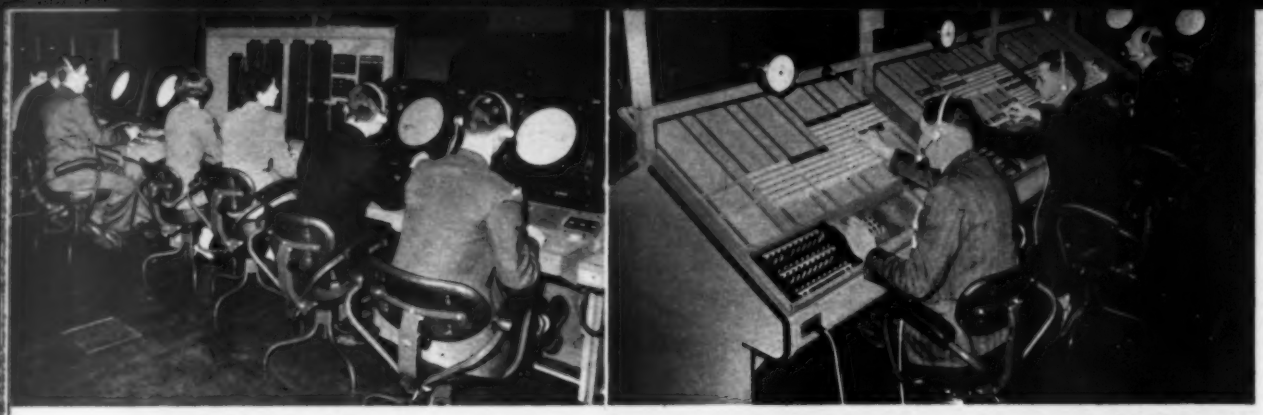
The heaviest responsibility of all falls upon the air traffic controller, who must receive aircraft into his sector, assess their position reports (from aural information unless radar is available) and give direction or holding instructions to enable separations to be maintained. When traffic is dense, the system becomes strained to its limit and delays inevitably ensue.

There becomes too much to do, too much to say, no time to think. The tally system used to indicate the passage of aircraft into the controller's sector is antiquated, and overmuch time is spent in communicating with aircraft and *via* land-lines to other control offices. The "telephone-complex," air traffic controllers complain, saps the A.T.C.O.'s attention for too long. "A control officer," the Guild of Air Traffic Controllers declared at their first meeting last year, "should be required only to look, to listen, to interpret and to talk. Other agencies must be provided to record and present." Little wonder that traffic controllers at peak periods in heavy summer are duty-limited to two hours and pilots maintain a constant listening watch on the almost unbroken transmission on their frequency-in-use, monitoring position reports of other aircraft. Not all air traffic controllers are as efficient as those at London Airport; control from less developed termini can sometimes be most kindly described as "token." Nor has the problem of the military aircraft been resolved; so much of the air above the British Isles is controlled airspace that infringement is almost impossible to avoid, particularly since most military traffic is beyond the jurisdiction of the civilian controller.

The North Atlantic brings problems of its own. In 1956 *more than half* of all transatlantic flights suffered—in the words of I.C.A.O.'s Jet Age Task Force—"substantial difficulties" in communications or air traffic services and 40 per cent had to change their flight plan after departure. A further 20 per cent were delayed on the ground awaiting the air traffic clearance that would give them the very wide separations—30 minutes' flying at any given altitude—necessary in view of the inadequacies of position-fixing facilities and the uncertainties of air-to-ground and fixed services (ground-to-ground transmission of information) over the North Atlantic. On this route A.T.C. and communication have in



This "Flight" diagram shows (not to scale) the trend towards integration of air traffic control and navigation equipment. Automatic communication, now used in several projects, is represented by telemeter and teleprinter links. Surveillance radar, with transponders, is already being set up; and automatic integrated presentation in the A.T.C.C. has been developed. The airborne navigation system, here made up with Doppler radar, could be based on Dectra or other systems.



One of the most advanced and efficient control centres in the world is the Southern A.T.C.C. located at London Airport. Surveillance radar and tally systems are in use for control. Personnel are shown at the radar scopes, left, and procedure control station, right.

THREE-DIMENSIONAL DILEMMA . . .

fact been described as "the aviation world's outstanding case of immediate and compelling need for improvement."

Some of the reasons for this forthright statement are to be found in the blackouts suffered by high-frequency transmissions in arctic and sub-arctic latitudes, together with the lack of range of position-fixing facilities and V.H.F. communications. The result is unrealistic separations (thirty minute spacings) and a communication coverage which lags far behind the extensive requirements of more than 150 aircraft crossing the Atlantic every day.

To summarize in general terms the multiple problems of air traffic control: on the North Atlantic the need is for reliable position reports regardless of weather conditions. In the crowded skies of Europe (and similarly in the U.S.A.) facilities for position-reporting exist. But they are not accurate enough, are too difficult to transmit, and are too many to assimilate on the ground. Nor are ground communications always adequate.

Is the solution to be found, perhaps, in more and better radar? There is no doubt that long-range and zone radar control (the early-warning, zone-surveillance and height-finding equipment installed at London Airport is a good example) have gone far to relieve the controller of much of the mental agility required to visualize the position of all the aircraft under his control. It satisfies the primary requirement that information should be presented visually to the controller, and it will show the positions of military aircraft making more or less random movements through the sector.

But it is still necessary for pilots to report their positions, and for aircraft to make identifying turns for their positions to be positively established on the controller's radar screen. The principle of visual indication is one which can usefully be extended. In the Flight Log of the Decca Navigator, the pilot is afforded the ideal presentation of his position—a marked-map display. Very-high-frequency V.O.R. bearings and distance-measuring equipment are also used to determine accurately the aircraft's position. Decca is in wider use in Europe than V.O.R./D.M.E., and aircraft fitted with it are permitted to fly at reduced separations—an example of the improvement in control which is possible with refined aids.

In the U.S.A. and Canada, ambitious schemes have been undertaken to provide airport and airways surveillance radar from coast to coast, eventually giving an area coverage over most of America and all but the most sparse Canadian routes. And surveillance radars—connected by landlines to A.T.C. centres—are being introduced in England to the Prestwick and Preston Control areas. Surveillance radars of this type can function reliably without interference from the weather (by circular-polarization or rain-removal) at ranges which give definitive indications ("solid cover") to 65 miles or more.

Yet the progressive addition of radar as an air traffic controller's tool is less an improvement than the fulfilment of a stark necessity. More aid and particularly more *simplification* for pilot and controller alike in the passing of information is still needed. Further reductions in separation are the only answer to more aircraft (with traffic doubling every five years), higher speeds, more critical operating techniques. While jets and pistons co-exist, the airways must cater for their contrasting performance.

The problem of air traffic control on the world's air routes is being squarely faced by I.C.A.O., whose Implementation and Jet Operational Requirements Panels have been meeting regularly since the urgent need for their formation was foreseen at the Caracas assembly last year. It is to I.C.A.O. that the nations' governments are looking for guidance upon international standards and procedures to be adopted for traffic control. Inevitably, the aids required will be expensive (the U.S. Federal Airways Plan for 1957 to 1961 involves the expenditure of $246m; $57m is being spent upon radar alone) and a clear plan for guaranteeing safety in the air must be presented before governments can be expected to foot the bill.

Although the discussions of the past months have not yet reached the rubber-stamped conclusion stage—bright ideas are still put forward, navigation and communications systems are still being evaluated—the pattern of A.T.C. for the traffic expansion of a year or two ahead is falling into shape. Without selecting for special commendation any particular body of researchers, the thoughts of the International Federation of Air Line Pilots' Associations may be said to correlate as closely as any others the needs and desires of those who are required to maintain the close confidence between pilot and controller which is the heart of successful traffic control.

Their recommendations are for more and still more automatic operation in every aspect of the control field. Automatic flight-planning with "go" or "no-go" answers; meteorological information transmitted and received by teletype; three-dimensional position displays for the controller. Better still, the development of a system whereby the controller merely has to monitor an electronic computer which accepts or rejects information fed into it—again automatically—from the navigation aid and flying instruments in the aircraft. And, in view of the price of failure, an ever-vigilant monitor constantly watching the complex traffic pattern should be an overall system of long range, weather-proof radars, backed by secondary radars—transponders which boost the return radar pulse—in jet transports.

These solutions are demonstrably not just dreams of perfection. Under development now for U.S. Navy Tacan is a data link computer which offers considerable relief to controller and pilot alike by taking over much of the communications work automatically. Bearing, distance, speed, altitude and heading are transmitted automatically from the aircraft as a modulation of the normal Tacan signals; and this information, received from up to 120 aircraft, could well be displayed on a special radar converter which translates surveillance radar "blips" into code groups of letters and digits projected on a map screen. Push-button selection of certain much-used pre-determined messages by both pilot and controller is another way in which it is proposed to relieve over-congested voice channels.

A good deal of radio communications capacity is taken up with routine transmission, on a broadcast basis, of weather information and other messages of general interest. In the aircraft, an operator has to listen for and record such information as it is transmitted, but recent experimental use of ground-to-air radio teleprinter links show that matter of this kind can be teleprinted in the aircraft and thus stored on paper for examination at leisure by the crew. Like the Tacan data link, the airborne teleprinter shows promise in relieving crews of intensive and distracting communication traffic.

Similar expedients on the ground can be applied to provide the controller with a visual plot of aircraft movements, to relieve him of the necessity for keeping tallies. Complete and easily interpreted information on aircraft position and behaviour can be pictorially presented on a large map screen. An example of such a technique now in service is the Standard Telephones and Cables, Ltd., automatic V.H.F. fixer system, which projects C.R.D.F. (cathode-ray direction-finding) traces from several outlying stations onto a central ground-glass map screen. Further developments are in hand—in Belgium—to include on the same screen a surveillance-radar plot, so that V.H.F. fixing can be used to identify aircraft traces without special preliminary procedure manœuvres.

A most important concept is the use of precise position-fixing aids (described in *Flight* for April 12) in conjunction with airborne navigation computers which will be sufficiently accurate and flexible to allow aircraft to be routed to and from destinations without necessarily staying in airways. Doppler radar particularly commends itself for such a purpose, since it is completely independent of ground aids, is accurate, and is unlimited in range. A data-link system could be used to transmit all relevant information directly

(Concluded at foot of page 584)

What Price Air Fares?

The Real Foundation of Air Commerce: Present Trends and Future Possibilities

THERE was once a Rugby player who, having kicked the ball into a tree, fervently cried: "Never mind the ball—let's get on with the game!" Air transport resembles football inasmuch as the main object of the pursuit, the airline passenger, is sometimes overlooked by those who live close to the technical frenzies and political complexities of the pursuit itself.

Admittedly the passenger is seldom deposited in the top of a tree; but he is not yet the object of a chase as single-minded as it could be, even though he is the industry's main consumer. This is not to say that the airlines do not try to attract and keep customers. They do—but within limitations which are, in any final analysis of the industry's rate-making machinery, imposed by the national politics which have influenced air transport since the day it began in 1919. So long as countries regard air transport as an essential instrument of national power, which they will protect and if necessary subsidize, so will the industry's most important consumer, the occupant of the airline seat, fly less far for his money than he might in a perfect non-political world.

If that perfect world of free air commerce *did* exist, the actions of every airline might be wholly directed to cutting fares, on the theory that air transport cannot reap the greatest riches by selling speed and convenience alone: it must eventually sell these commodities at surface-transport prices. Even with its present higher fares, air transport—so great is the attraction of its speed and convenience—will continue to expand faster than its surface competitors.

But the rate of expansion will slacken—and is indeed showing signs of doing so—unless a new passenger-market can be found. Why, it might be asked, does it matter all that much if the rate of expansion *does* slacken? Cannot the airlines, like the older forms of transport, make money out of traffic which just increases at a rate proportional to the rise of world incomes and populations? Why must they find a mass market?

The airlines' net profit is less than one per cent of their total revenues—and if public subsidies and "hidden" subsidies (e.g. re-equipment loans at interests lower than market rates) were to be removed from these revenues the margin would be less—probably it would be a deficit of several per cent. This is a fact which the public, as I.A.T.A.'s director-general, Sir William Hildred, has said, might find difficult to reconcile with gleaming airliners, pretty stewardesses, and luxurious cabin service. It is apparent that the air transport industry is some way from achieving the economic stability which will enable it to stand rising world prices and to throw off its subsidies. Obviously governments are keen to see their protégées operating free of subsidy, and in fact most flag carriers are moving steadily in this direction.

The key to better economics, as in any industry, lies in the application of more efficient tools to mass production. To put it in air transport language, the airlines must use larger and more efficient vehicles with which to manufacture their capacity ton-miles at the lowest possible cost. They will only procure big revenues by using large low-cost-per-seat-mile transports filled right up and operated hard and at high traffic-generating frequencies.

Therein lies the explanation of the airlines' massive turbine re-equipment programme, and of the trend in I.A.T.A.'s fares-policy towards a "thrift"-class level of prices: new tools—and the creation of a demand which will enable them to be applied to mass production.

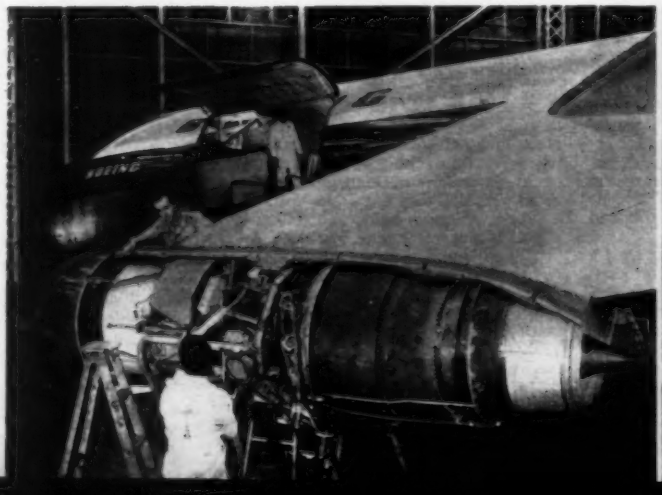
It is not within the province of this article to consider whether the new aircraft ordered by the airlines are the most efficient on the market. The fact is that nearly all the new types of turbine transport now on order—£800 millions-worth, from the local-service Friendships to the long-haul 707s and DC-8s—will be cheaper per seat-mile to operate than the piston-engined transports they will replace. They therefore meet the "more efficient tool" requirement.

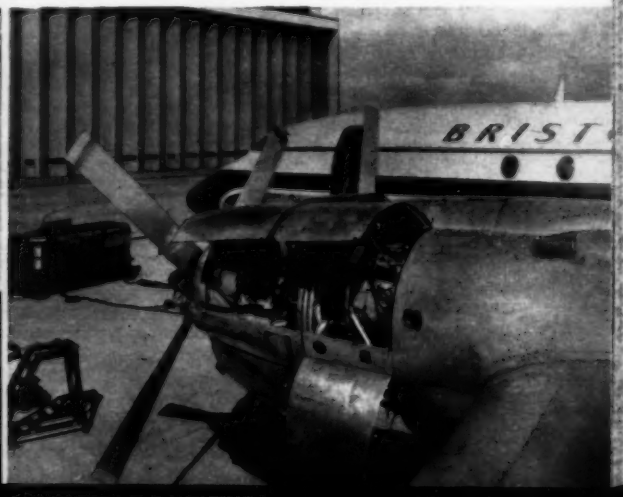
What steps have the airlines taken towards the application of these tools to mass production? Six years ago they took the momentous decision—despite (or because of?) small profits—to introduce tourist-class air-coach travel at fares 30 per cent below existing levels. Like most fare-innovations, tourist travel was sponsored by American carriers, and it was first introduced on U.S. coast-to-coast services. Soon it was adopted on the North Atlantic and it eventually spread throughout the world, until today it accounts for about 40 per cent of total world air-passenger traffic. (In the country of its origin, the U.S.A., the figure is about 35 per cent.)

The effect of tourist fares was an almost immediate increase in traffic, especially on the long-haul sectors; but it did not increase revenues. This was disappointing, and for two years past the airlines have been pondering how much further they dared go in reducing fares to lure the mass market. They knew from tourist experience that fare-reductions would expand the market, but they were not convinced that there would be a corresponding increase in revenues.

This was the background to the historic I.A.T.A. traffic conference which met at Cannes last year, and which agreed—after initial tough opposition from certain European carriers—to a new level of North Atlantic fares 16 per cent below existing tourist fares. The move was sponsored by the Americans, notably by Pan American and T.W.A., with the moral backing of the U.S. Government's Civil Aeronautics Board. Like every I.A.T.A. decision, it had to be agreed with 100 per cent unanimity. Failure to

Turbojet and turboprop: will there come a demand for these two forms of transport propulsion to be differentially priced?





Fares are recommended to governments by I.A.T.A., the body which represents the carriers of 90 per cent of the world's air traffic. Here is the executive committee, gathered at the 1956 annual meeting at Edinburgh. The members are:

Clockwise from extreme left: Sir Leonard Isitt, Tasman Empire Airways (hand on knee); D. M. Robbertze, South African Airways; Sir Hudson Fysh, Qantas; Croil Hunter, Northwest Airlines; Lord Douglas, B.E.A.; John Leslie, P.A.A.; Per Norlin, S.A.S.; Gilbert Perier, Sabena; Gordon R. McGregor, T.C.A.; Dr. Walter Berchtold, Swissair; F. von Balluseck, K.L.M.; A. J. Quin Harkin, manager I.A.T.A. Clearing House, London; Dr. H. J. Gorecki, I.A.T.A. financial director; F. J. H. Johnston, I.A.T.A. Asst. treasurer; Warren Lee Pierson, T.W.A.; A. Laurence Young, I.A.T.A. secretary; Sir William P. Hildred, I.A.T.A. director-general; Maj. J. R. McCrindle, B.O.A.C.; Prof. John C. Cooper, I.A.T.A. legal adviser; J. W. S. Brancker, I.A.T.A. traffic director; Col. Luis Calderon, Linea Aeropostal Venezolana; M. Rene Briend, Air France; J. R. D. Tata, Air India (foreground).

WHAT PRICE AIR FARES? . . .

agree might have resulted in a price war, a subsidy war, rate-fixing by governments, threats to abrogate traffic rights—all manner of unsavoury alternatives which no airline could ever entertain. And all, incidentally, powerful ammunition for I.A.T.A.—who are always very touchy about words like "cartel" and "price-ring"—to fire at its critics.

The precise definition of the new thrift-class service—seat pitch, baggage allowance, standards of service, and so on—remain to be settled. It is not yet even clear whether there will be room for present tourist fares in between thrift-class and first-class (and a new luxury class—also decided upon at Cannes). But it is clear that when it comes, in April of next year, it will give a big traffic-generating impetus to air transport; and it will spread, as tourism did, from the Atlantic throughout the world.

Consider how the new fare may be expected to divert sea traffic on the Atlantic route. Despite the fact that the single one-way air fares between London and New York are now £283 first class and £186 tourist, compared with equivalent sea fares up to £272 and £134, air traffic is increasing faster than sea traffic (15 per cent per year compared with 5 per cent). The thrift-class air fare will be about £150—about the same as the lowest first class sea fare and only about £20 more than the tourist sea fare.

Add to this the new low emigrant and 15-day excursion fares and it becomes obvious that the air will take traffic from the sea at a rate even greater than it has been with considerably higher fares.

Thus have the airlines moved towards creating the mass market for their new capacity-ton-mile production machinery to work on.

To say, as many people do, that the operators who have bought big jets have "gone overboard" is to overlook realities—the hard realities of a competitive, subsidy-prone industry in which speed is the dominating and pace-setting influence. But there is much weight in the argument that if some airlines insist on offering the highest speed which is technically attainable others should insist on being allowed to take advantage of the lowest technically feasible operating costs—passing these on to the public consumer in the form of lower fares.

The possibility that the airlines will agree upon a fare differential between jet and turboprop seems at the moment remote, so strongly in the majority will the long-haul jet operators be. But as more and more jets for *all* the range categories are ordered for the sixties, it is certain that greater and greater pressures will be exerted by the turboproponents for the establishment of a differential fare.

Whether this will ever come about in the face of certain resistance from the jet protagonists is truly anybody's guess. All that seems certain at the moment is that in the next few years—probably when 707s, DC-8s and Britannia 310s are plying the Atlantic, and jets and turboprops are flying between European capitals—the differential fare will become a crucial issue. A guess at its outcome at this early stage might be that differential pricing of jet and turboprop travel will eventually come about; but only if the jet becomes firmly established as the next performance "plateau" of air transport. The jet operators—starting no doubt with the influential U.S. long-haul carriers—may then bow to a differential, leaving to the propeller-driven transports the field of lowest cost travel. "Bow" is used deliberately, because the strongest resistance to a differential fare will come from the airlines with the biggest investment in jets. In other words, from all the world's major airlines. They will never countenance the idea of a premium charge for jet travel, but they may agree—when the jets have settled down and become the norm of long-haul travel—to conceding an ultra-low-fare mass market to the turboprops and to the old piston transports.

But differential pricing, if it comes, will not be applied generally to all types of heavy-traffic sectors. It will appear on long-haul routes such as the Atlantic as a concession from the jet operators (who may even buy new turboprops to take advantage of it themselves). And it will appear on short-haul sectors, such as those in Europe, as the result of pressure from the turboprop operators, who will not take kindly to their first-class traffic being taken—as it certainly will—by the forthcoming *genre* of short-haul jets.

It might be argued that differential pricing will be nothing more than a I.A.T.A. agreement to allocate first-class travel to the jets and thrift-class travel to the propellers. But the demarcation will not be so cut-and-dried—simply because the first-class market will not be big enough to sustain all the jets that have been ordered. It is the mass market which must be exploited for richest rewards, and the jet operators will not be likely to concede it to the turboprops just because those vehicles are more economically qualified to offer it.

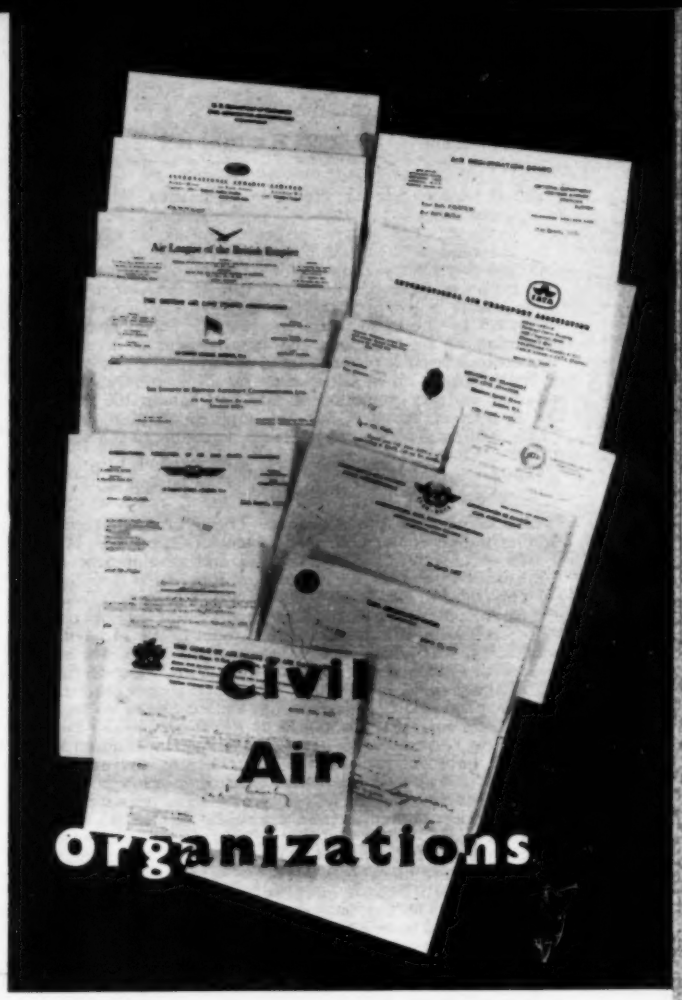
This may be considered tough on Mr. Average Passenger; but he must remember that he is not the main object of pursuit in the game of air transport. To wish he were would be to substitute hopes for realities—realities of prestige and politics. J.M.R.

THREE-DIMENSIONAL DILEMMA (continued from page 582)

into the control centre and to display it on a screen. A diagram of such a system, combining Doppler in the air and surveillance radar on the ground, with automatic data transmission and presentation systems, is reproduced on page 581. A teleprinter link for flight information reception and a weather radar are included in the equipment of the hypothetical aircraft shown, since information received from both these sources is extensively used by the pilot in managing his aircraft. The surveillance radar network will, of course, exist only over land and coastal waters, but it will nevertheless have an important function in supplementing the airborne position-fixing system and in dealing with aircraft not so equipped. The transponder beacon is also being introduced to support surveillance radar. It is evident that ground-based navigation systems such as Decca Navigator and Dectra, with a Flight Log, may replace Doppler in areas where coverage exists.

Both Doppler and Dectra offer greater accuracy than other aids used at present over the North Atlantic. But in this area air-to-ground communications will continue to present serious problems. For the fixed service communications between the ground control centres, forward-scatter V.H.F. and U.H.F. (more correctly termed transhorizon transmission or transhorizon propagation) systems are being developed to increase ranges in these frequencies up to about 1,200 miles. Though this will bring about considerable improvements by providing urgently needed additional frequencies and avoiding magnetic blackouts which affect present H.F. radio links, airborne forward-scatter equipment is still some way off. High transmitter powers, very sensitive receivers and special aerial systems are needed, and these are not readily accommodated in an aircraft.

North Atlantic traffic control, apart from the great improvements in position fixing promised by Dectra and Doppler radar, is still a thorny problem. But the technique and equipment for overland control in areas of dense traffic is now developing towards a degree of automaticity which offers a prospect of real improvement both in traffic density and in ease and accuracy of control.



AS air commerce has grown so has the number of organizations—national and international—concerned with it. The following alphabetical review of the principal bodies briefly sets out their constitutions and functions. It may serve to clarify the confusion which so many sets of initials—e.g., A.T.A., I.A.T.A., B.I.A.T.A.—inevitably create.

Aerodrome Owners Association. Founded in 1934, the A.O.A. exists to protect and further the interests of the commercial and municipal owners and operators of aerodromes in the British Isles which are not under State control. One of the principal current objectives of the Association is to obtain the approval of the Ministry of Transport and Civil Aviation for higher landing fees (which remain at their immediate post-war level) and more widespread Customs facilities .

CHAIRMAN, Alderman R. W. Marshall; SECRETARY, S/L. A. W. Day. ADDRESS: Londonderry House, Park Lane, London, W.1.

Air League of the British Empire. An independent body founded in 1909, the League's original aim of "spreading information showing the vital importance to the British Empire of air supremacy, on which its commerce, communications, defence and . . . existence . . . depend" remains unchanged. Every aspect of British aviation is the League's concern, with special emphasis on air defence.

A campaign by the League for the liberation of air freight from Customs restrictions at London Airport was brought to a successful conclusion in November last year; at the moment a working party is urging the M.T.C.A. to institute commercial pilot training scholarships, and a special Committee is about to undertake a study of British civil air transport.

CHAIRMAN, Air Chief Marshal Sir George Pirie, K.C.B., K.B.E., M.C., D.F.C., L.L.D.; SECRETARY-GENERAL, F. N. Hillier, M.C. ADDRESS: Londonderry House, Park Lane, London, W. 1.

Air Registration Board. An independent, non-profit-making limited company, the main duties of which are to assess aircraft technically for the issue and renewal of certificates of airworthiness. This entails the publication, in the form of British Civil Airworthiness Requirements, of standards for design and construction, modifications, flight-test schedules, flight manuals, performance schedules, maintenance manuals and maintenance schedules; and associated flight testing.

Another responsibility of the A.R.B. is to examine and issue licences to aircraft maintenance engineers, and to carry out technical examinations of commercial pilots and flight engineers on behalf of the Ministry of Transport and Civil Aviation. In addition to the B.C.A.Rs. referred to above, the Board publishes notices to engineers, inspection leaflets, explanatory handbooks, defect reports and an aircraft register.

The body consists of a council of 18 unpaid members. Four represent the operators, four the constructors and four the insurance underwriters. There are four independent members and, in addition, one member speaks for the public and another represents the commercial pilots. The staff of the Board numbers about 250, of whom just over half are technical surveyors. This comparatively small number is made possible by the Board's delegation of responsibility in airworthiness matters to those actively engaged in industry, accomplished by granting approval to suitable organizations and individuals, the Board retaining the right of supervision.

CHAIRMAN, Lord Brabazon of Tara, P.C., C.B.E., M.C., F.R.Ae.S.; SECRETARY AND CHIEF EXECUTIVE, R. E. Hardingham, C.M.G., O.B.E., F.R.Ae.S.; CHIEF TECHNICAL OFFICER, Walter Tye, O.B.E., B.Sc., F.R.Ae.S. ADDRESS: Chancery House, Chancery Lane, London, W.C.2.

Air Research Bureau. Not to be confused with the Air Registration Board, which is commonly known in this country by its initials, the A.R.B., was constituted in 1952 with Air France, K.L.M., Sabena and Swissair as founder-members. They were joined soon afterwards by B.E.A. and S.A.S., and later by Lufthansa and Alitalia. There are today nine full members and two associate members, representing 92 per cent of the international intra-European traffic. The object of the A.R.B. is to contribute by means of studies, surveys, statistical comparisons and other research projects—undertaken in collaboration with its members—to the improvement and development of commercial air transport in Europe in the interests of the travelling public and the member carriers.

SECRETARY-GENERAL, Bo Bjorkman. ADDRESS: 67 Rue de la Loi, Brussels, Belgium.

Air Transport Advisory Council. Set up in 1947 mainly to consider representations from the public about the air transport facilities and charges provided by the Corporations, the Council was reconstituted in July 1952. Under the new terms of reference, the Council considers applications from the Corporations and the independent airlines for the operation and renewal of certain classes of scheduled services, and advises the Minister accordingly.

CHAIRMAN, The Lord Terrington, K.B.E.; DEPUTY CHAIRMAN, Air Marshal Sir John D'Albiac, K.C.V.O., K.B.E., C.B., D.S.O.; SECRETARY, K. J. Willoughby. ADDRESS: 3 Dean's Yard, London, S.W.1.

Air Transport Association of America. Founded in January 1936, A.T.A. is composed of U.S. flag airlines certified by the Civil Aeronautics Board for scheduled services over regular routes. Membership is at present approaching a total of 50 operators. One of the A.T.A.'s major functions is close consultation with the Civil Aeronautics Administration on matters of safety, traffic control, navaids, airports and so forth. The Association employs specialist experts on all matters pertaining to air transport.

PRESIDENT, Stuart G. Tipton; SECRETARY, J. D. Durand. ADDRESS: 1107 16th Street, N.W., Washington 6, D.C., U.S.A.

Aircraft Owners and Pilots Association. A.O.P.A. is the world's largest organization for civil aircraft pilots, to whose interests and welfare it is dedicated. It was founded in 1939, and today has about 60,000 members. Many facilities are available to members, including publications, insurance, legal aid and flight-planning.

HON. PRESIDENT, C. Townsend Ludington; PRESIDENT AND GENERAL MANAGER, J. B. Hartranft, Jr.; CHAIRMAN OF THE BOARD AND TREASURER, Laurence P. Sharples; SECRETARY AND GENERAL COUNSEL, Alfred H. Frisch. ADDRESS: P.O. Box 5960, Washington 14, D.C., U.S.A.

British Air Line Pilots' Association. The sole negotiating body for United Kingdom commercial pilots (to whom membership is restricted), B.A.L.P.A. is affiliated to the Trades Union Congress. Its objects of ensuring "the welfare of its members and the general good of civil aviation" are in the hands of 39 local councils, 11 of which are overseas.

The Association last year negotiated a new salary structure with B.O.A.C. which takes account of the weight, speed and type of aircraft flown, and long-haul and multiple-crew duties (e.g., when no radio officer or navigator is carried). They have also actively pursued aircrew flight-time limitations, and hold watching briefs at accidents Courts of Inquiry.

PRESIDENT, The Duke of Hamilton and Brandon, P.C., K.T., G.C.V.O., A.F.C.; CHAIRMAN, Capt. R. T. Merrifield; SECRETARY, D. Follows, M.B.E., B.A. ADDRESS: 95 Mount Street, London, W.1.

CIVIL AIR ORGANIZATIONS . . .

British Independent Air Transport Association. This body was formed immediately after the war as the British Charter Association, composed of 13 charter companies. At that time only charter activities could be carried out by private operators and B.I.A.T.A.'s aims and objectives were to promote the interests of its members. The name was changed to its present form in 1951, when the scope of the private British operators widened.

Objects of the Association include the encouragement and promotion of air transport; the improvement of national and international laws; improvements in administration; the collection of statistics and other information on all matters affecting the industry; and the promotion of "just and honourable practice in the conduct of business, and the suppression of malpractice." There are four grades of membership, according to the size of the member's fleet.

CHAIRMAN, G. H. Freeman; SECRETARY, A. M. Blakemore. ADDRESS: 13 Portman Street, London, W.1.

Civil Aeronautics Administration. The C.A.A. is charged by the Administration of the U.S. Department of Commerce, of which it is a part, with the encouragement and development of civil aeronautics in the U.S. It operates four main departments: (1) The *Office of Air Traffic Control*, which directs, co-ordinates, and controls the operation of all air traffic control facilities operated by or under the jurisdiction of the Administrator of Civil Aeronautics. (2) The *Office of Air Navigation Facilities*, which plans, directs, co-ordinates, and controls the C.A.A.'s engineering and technical activities, in accordance with operational requirements, of all air navigation facilities in the United States, its territories and possessions. (3) The *Office of Flight Operations and Airworthiness*, responsible for the examination, certification, inspection, and improvement of design, manufacture, and maintenance of aircraft and aircraft components; the competency and physical fitness of airmen; and the flight operations and technical facilities of air carriers, other aircraft operators, airman schools, and other agencies. (4) The *Office of Airports*, which administers the Federal Airport Program and acts in an advisory way in the design and construction of airports.

Each of the six regional offices is headed by a regional administrator, and the Office of International Co-operation by a director. Personnel of the latter office are stationed in areas served by U.S. international air carriers.

At its Technical Development Center at Indianapolis, the Administration carries on applied research and performs service testing and evaluation.

The C.A.A. is headed by an administrator appointed by the President of the United States.

ADMINISTRATOR, James T. Pyle; DEPUTY ADMINISTRATOR, William B. Davis; ASSISTANT ADMINISTRATOR (ADM.), S. A. Kemp. ADDRESS: Department of Commerce, Washington 25, D.C., U.S.A.

Civil Aeronautics Board. An independent, regulatory commission composed of five members, appointed by the President and confirmed by the Senate. The Board grants operating authority to American flag carriers for domestic and international routes and to foreign-flag carriers for routes to the United States; approves or prescribes rates and rate practices and determines mail-rate compensation (which includes in certain cases subsidies); seeks to ensure that reasonable and adequate services are provided for the public without discrimination or preferences or restrictive competitive practices; approves business relationships between carriers provided such arrangements are not adverse to public interest; prescribes safety rules and standards; and investigates accidents involving civil aircraft.

CHAIRMAN, James R. Durfee. ADDRESS: Washington 25, D.C., U.S.A.

Commonwealth Air Transport Council. Formed in January 1945, the Council's terms of reference are to keep under review progress and development of Commonwealth civil air communications; to serve as a medium for exchange of views and information between Commonwealth countries on civil air transport methods; and to consider and advise on such civil aviation matters as the Commonwealth governments may agree to refer to the Council. The fifth meeting was held in London last June.

CHAIRMAN, The Minister of Transport and Civil Aviation; SECRETARY, Mrs. V. Purnell. ADDRESS: Berkeley Square House, London, W.1.

Guild of Air Pilots and Air Navigators. A Livery Company of the City of London since July 1956, the Guild was founded in 1929. It cares for the interests of professional pilots and navigators and acts as a link between them and the various official bodies concerned with civil aviation.

The Guild acts in an advisory capacity to the Ministry of Transport and Civil Aviation in civil flying matters and issues and renews flying instructors' certificates. Each year selects recipients of four special awards, the Johnston Memorial Trophy, Cumberbatch Trophy, Brackley Memorial Trophy, and Derry and Richards Memorial Medal.

Recent activities have included the compilation of a brief on air safety, with special reference to flight-time limitations.

GRAND MASTER, H.R.H. The Prince Philip, Duke of Edinburgh, K.G., K.T.; MASTER, Mr. J. Lankester Parker, O.B.E., F.R.Ae.S., Hon.M.S.L.A.E.; CLERK, Major J. L. B. H. Cordes, F.R.S.A., A.F.R.Ae.S.; SECRETARY, Miss G. H. Mackay. ADDRESS: Londonderry House, Park Lane, London, W.1.

International Aeradio, Limited. The shareholders of I.A.L. are B.E.A., B.O.A.C., Alitalia, Air France, K.L.M., PanAm, S.A.S., Sabena, Swissair, Qantas, T.W.A., Air India, Australian National, and Aeronautical Radio Inc. The company's aim is to provide a service for aviation when required anywhere in the world. Services include the installation, operation and maintenance of radio communications and aids to navigation, air traffic control, fire services, airport management, and the setting up of technical training schools. The company maintains an engineering division, and acts as aviation and communication consultant to the radio industry and to various overseas administrations. The Aerad division publishes the *Flight Guide* series of route manuals and the *Air Mileage Handbook*.

CHAIRMAN, Sir Victor H. Tait, K.B.E., C.B.; MANAGING DIRECTOR, C. S. Cadell, C.B.E., M.A., A.M.I.E.E.; GENERAL MANAGER, G. R. Scott-Farnie, A.M.Brit.I.R.E., M.I.N.; SECRETARY, H. A. Adams, A.C.A., F.T.I.I. ADDRESS: 40 Park Street, London, W.1.

International Air Transport Association. I.A.T.A. was formed (at Havana in 1945) as a result of decisions taken at the Chicago Civil Aviation Conference of 1944. Its stated purpose is: "To promote safe, regular and economical air transport for the benefit of the peoples of the world, to foster air commerce and to study the problems connected therewith; to provide means for collaboration among the air transport enterprises engaged directly or indirectly in international air transport service; to co-operate with I.C.A.O. and other international organizations."

I.A.T.A. today comprises 70 active and six associate members who carry between them about 95 per cent of the free world's scheduled domestic and scheduled international traffic. It is the agency through which these airlines seek joint solutions to the problems of flying and of conducting business at international level. The Association administers the airlines' efforts to standardize and simplify practices and procedures; operates an international clearing house for the settlement of interline transactions; puts forward the airlines' views in the development and application of the 15 I.C.A.O. Annexes; and holds regional Traffic Conferences for the recommendation to governments of rates and fares. It is a principle of the Association that members' decisions must be unanimous, and a requirement states that they cannot take effect unless all interested governments approve.

Business is conducted by offices at New York, London, Paris and Singapore and by standing committees dealing with financial, legal, technical, traffic and medical affairs at numerous meetings throughout the world. Approximately 40 meetings are scheduled for this year. Last year's annual general meeting was held in Edinburgh, this year it is to take place in Madrid, in September.

A summary of the Association's work and airline operating statistics is contained in the I.A.T.A. *Bulletin*, previously published twice yearly, but now to be produced annually.

DIRECTOR-GENERAL, Sir William P. Hildred, C.B., O.B.E.; PRESIDENT, Lord Douglas of Kirtleside, M.C., D.F.C.; PRESIDENT-ELECT, Dr. Tomas Delgado; TREASURER, Dr. Henry J. Gorecki; TRAFFIC DIRECTOR, J. W. S. Brancker; SECRETARY, A. Laurence Young. ADDRESS: Terminal Centre Building, University Street, Montreal 3, Canada.

International Civil Aviation Organization. The organization established as a result of the 1944 Chicago International Civil Aviation Conference, I.C.A.O. now comprises 70 member-states. The I.C.A.O. Council consists of 21 nations elected for their importance in civil aviation. I.C.A.O.'s objective is to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport in order to ensure that the growth of civil aviation is safe and orderly; that aircraft design, the operation and development of airways, airports and air navigation facilities are encouraged; that the rights of contracting states are fully respected; and that safety of flight in international air navigation is promoted.

Some of the most important work of I.C.A.O. is to prepare and revise, as advances in aeronautical technology demand, the 15 Annexes to the Convention on International Civil Aviation. These provide international standards and recommended practices for personnel licensing; rules of the air; meterology; aeronautical

(*Concluded at foot of page 592*)

THE BRITISH AIR CORPORATIONS (1)

B.O.A.C.

Now in full service to South Africa and Australia, the Britannia 102 comprises B.O.A.C.'s first-line equipment. This picture shows G-ANBC with its newly styled fin point-scheme.

FOR the British Overseas Airways Corporation the past year has been a crowded, eventful and in many ways a salutary one. There have been big changes in management, important decisions about future equipment policy, and a subtle but definite trend towards greater commercial independence. Although Britain's appointed overseas flag carrier has not had an untroubled year, it has at least emerged from it with clearer policies for the future, and—most important of all—with a profit.

The changes in leadership last May, when Sir Miles Thomas resigned, confronted the Minister of Transport and Civil Aviation with many difficulties, not the least of which was to reconcile the desirability of internal promotion with an inclination to tuck a State-owned concern closely under the Ministerial wing. But a workmanlike leadership resulted; and although Mr. d'Erlanger and Sir George Cribbett did not come up from the ranks, but were brought in by the Minister from outside, they were men who knew the air transport business. And the Corporation won a point of principle in the appointment of Mr. Basil Smallpeice as managing director. It was recognition of the fact that the day-to-day commercial affairs of a commercial enterprise—State-owned though it might be—should be directed by men promoted from within.

Later in the year, in November, B.O.A.C. scored another point. It had been clear during the six months before Sir Miles resigned and the new management took office that the Corporation would have to order American jets, notwithstanding its traditional "obligation" to the British aircraft industry (with which, at that time, it had orders outstanding for about £85 millions). The outcome of a further six months of discussion between the Government, the industry and the Corporation (which had now formed an aircraft requirements committee) was that an order for 15 Boeing 707s was approved, on condition that these aircraft should be disposed of when a "comparable" British design, the de Havilland D.H.118, became available in 1962. The extent to which B.O.A.C. might have been coerced into this compromise has never been clearly established; but whatever the circumstances may have been the D.H.118 project was dropped two months later.

The Corporation can now look forward to a long period during which it will be most competitively equipped. Bristol Britannia 102s are now in full service to South Africa and to Australia, and will soon be the staple equipment for all the Far East services. The Constellation fleet is to be progressively withdrawn and disposed of and Argonauts will concentrate on secondary operations to East and West Africa (three of these aircraft have been disposed of to E.A.A.). Later in the summer the first of B.O.A.C.'s long-range Britannia 312s are due to be delivered, and they should start to take over the Monarch services to New York later in the year. They will be operated on a thrice-weekly "daylight service", leaving London after breakfast and arriving in New York for dinner.

Britannias should give B.O.A.C. (and El Al, who also intend to introduce them on to the North Atlantic this year) an indisputable advantage on this vital route for a clear year, at least until PanAm introduce their Boeing 707s in December of next year. The Britannia 312 will in due course operate the newly opened service from London to Los Angeles (the extension of the route to New York, linking in California with Qantas), taking over this operation from the Seven Seas Fleet. These latter aircraft will continue to provide adequate capacity for the Corporation's other tourist-class and mixed-class services between the U.K., Canada and the U.S.A. Stratocruisers in the meantime will continue to operate the Monarch services—a number having recently been given Slumberette seats and interior redecoration—until these popular old piston transports are completely displaced by Britannias. They will then be diverted to other routes (some are already operating to West Africa, in support of Argonauts).

The summer of next year should see the reintroduction of Comets, when the first 4s are due to appear on the Corporation's routes to the Far East. They are likely to be unchallenged on these routes for two or three years. The 4s will be preceded into service —though not into passenger service—by two Comet 2Es, which are due to start route-proving and training flights later this summer. These operations will service also to amass hours on the Rolls-Royce Avon RA.29, powerplant of the Comet 4, two of which will be fitted (outboard) to each of the two Comet 2Es.

Finally, in 1960, B.O.A.C. will introduce the first of its Conway-powered Boeing 707s into service.

The very strength of the Corporation's equipment position is in one sense its weakness: few other world airlines have such a multiplicity of major types—six in all—on their books, and the effect on operating economy must inevitably be adverse. Crew-training alone will require a non-stop programme extending over the next four years. It is little wonder that—at least until very recently—the Corporation has appeared unwilling to commit itself to definite requirements for the medium jet which it will need to replace Comets before the mid-sixties—a subject which is discussed on pages 578-580.

Commercially, the financial year 1956-57 surpassed B.O.A.C.'s expectations. When Mr. d'Erlanger took office last May and had had a few weeks in which to take stock, he forecast that the Corporation was likely to end the year with a loss of about £1,500,000. In the event a small surplus (the exact amount has not yet been revealed) was achieved. A preliminary assessment of the sparse details so far disclosed about the year's trading shows that the increases in revenue (13½ per cent), capacity (8 per cent) and passenger-miles flown (11½ per cent) were all less than the comparative increases of the previous year. Furthermore, costly and unforeseen setbacks to the Britannia 100 programme, caused by engine-icing troubles, deprived the Corporation of nearly nine months' revenue from these aircraft. (The Britannia was introduced on to the South African route on February 1.) It is therefore reasonable to assume that the surplus was achieved by high load-factors and by considerable savings in operating cost and efficiency—the latter a healthy sign of continuing success for the Corporation's efforts in this direction.

Finally, B.O.A.C. has ambitious plans for the future expansion of its world network, including hopes for the opening of a trans-Pacific route from San Francisco to Australia—which would provide the last link in a London-to-London-service around the globe.

Mr. Gerard d'Erlanger, Sir George Cribbett, Mr. Basil Smallpeice.

Senior executives of B.O.A.C. include: Mr. Gerard d'Erlanger, chairman; Sir George Cribbett, deputy chairman; Basil Smallpeice, managing director; Major J. R. McCrindle, adviser international affairs; Keith Granville, commercial director; A. C. Campbell Orde, development director; H. O. Houchen, director of current operations; K. H. Staple, legal adviser; C. Abell, chief engineer; K. W. Bevan, financial comptroller; G. H. C. Lee, general sales manager; H. C. Spear, chief personnel officer; J. R. Stainton, chief of ground services; Capt. J. N. Weir; chief of flight operations; F. C. Gillman, chief Press and information officer; Dr. K. G. Bergin, chief medical officer; Sir Duncan Cumming, director (associated companies).

Fleet: 20 Argonaut, ten Britannia 102, ten DC-7C (six delivered), 16 Lockheed L.749A Constellation, 16 Stratocruiser. On order: five Britannia 102, 18 Britannia 312, 19 Comet 4, 15 Boeing 707.

Operating Results for the year ended December 31, 1956: 388,342 passengers; 6,559,100 kg of freight (including diplomatic bags) and 3,719,700 kg of mail carried; total revenue £44.3m; 18,749 staff.

Headquarters: London Airport, Hounslow, Middlesex.

THE BRITISH AIR CORPORATIONS (2)

B.E.A.

The Corporation's first-line equipment for the years immediately ahead—the Viscount 800.

IT must have been with a feeling of relieved satisfaction that Lord Douglas of Kirtleside, chairman of British European Airways Corporation, disclosed last week that the Corporation had succeeded in making "a small profit" during the financial year which ended on March 31. The monthly progress of the year's trading had caused him and his colleagues some concern. It became apparent towards the end of the 1956 summer season that the target-profit for the year (B.E.A. budgeted for £750,000) would not be met; and a few months later the chairman was hinting that only by a strenuous effort would the Corporation scrape home with a surplus.

The actual 1956-57 profit has not yet been announced (see report on page 571), but probably it is barely as much as the £63,000 which B.E.A. achieved two years ago—the first time a profit was made. Certainly this year's surplus will be considerably less than the £603,000 made last year.

The reasons are threefold: (1) B.E.A. had a very poor summer and a disappointing Christmas; (2) suffered—like most other business in the country—from rising costs and the economic situation; and (3) lost much Middle East traffic because of the political troubles in that area.

The explanation of the poor summer business cannot be laid wholly at the door of reduced public spending, and it is still something of a mystery to B.E.A. that relatively fewer people should have flown abroad in this country's notoriously bad-weather summer of 1956 than in the perfect summer of 1955. B.E.A.'s whole economy is based upon the six summer months—so seasonal is the nature of European air passenger traffic—and any trading shortfall in that period is difficult, if not impossible, to recoup in the winter. A good Christmas week may be the only opportunity for recovery: but, as luck would have it, Britain was fogbound during the five peak holiday traffic days before last Christmas, and B.E.A. lost possibly as much as £100,000 as a result.

The Suez and Cyprus upheavals, which affected a vital proportion of B.E.A.'s traffic (to Athens, Cairo, Beirut and Cyprus), were a further drag on the economy, which has been increasingly hard-pressed by rising costs. The moving annual curve of costs has been drawing ominously closer to that of revenue.

Nevertheless, though traffic increases were substantially less than in the previous year, results for the year again passed previous records. Nearly 2¼ million passengers were carried, more than half of them on international routes.

B.E.A.'s fleet continues to be the most modern in Europe. The Corporation took delivery last December of its first Viscount 800s, of which a fleet of 38 is now being delivered at a steady rate. These competitive aircraft first went into service on the Paris route, the mainstay of which has hitherto been Elizabethans. (These popular piston transports, of which B.E.A. have 19, are being placed on the second-hand market as Viscount 800s come into service.) In April, 800s inaugurated the first British services to Ireland, as a result of the new agreement between the two countries.

Other new points to be added to the network this summer are Valencia and Belgrade, and discussions are under way for the opening of a new service to Warsaw. Operations to other East European cities will be started "as soon as conditions permit."

The Corporation has solved its future DC-3 replacement problem by deciding progressively to displace its DC-3 Pionair fleet with the 25-strong Viscount 700 fleet (reduced from 26 as a result of the unfortunate accident at Manchester on March 14). The Viscount 700 is considered ideal by the Corporation for domestic services, especially as by 1960 depreciation costs will be nil. Passenger complement will be increased from the present 47 to 60. The idea of transferring Viscount 700s to DC-3-type passenger work is one which a few years ago—when the DC-3 replacement campaign was in full swing—might have been discounted. But it may well develop into a general trend, and it is indeed already showing signs of doing so (witness T.C.A.'s domestic services). Although a new Viscount 700, even with 60 seats, could not match the seat-mile costs of a specially designed local service branch-liner, it would do so if first cost had been written off the books, and if fleet engineering charges could be shared—as they will in B.E.A.—with those of a fleet of newer 800-type Viscounts used on first-line services.

The year saw a setback to B.E.A.'s helicopter operations: passenger services, after five years of experimental schedules, were finally discontinued "until the advent of economic, twin-engined helicopters." Rightly or wrongly—views differ even within B.E.A.—there will now be no large-scale British helicopter-passenger operations until the Rotodyne and the Bristol 192 are available for service in the 'sixties.

Half-way through 1956 it became known that B.E.A. were looking for "a small quantity" of short-haul pure jets to maintain their competitive position in the 'sixties—mainly on the European sectors which will be plied by other operators' Boeing 707s and Douglas DC-8s. This was a radical departure from B.E.A.'s all-turboprop fleet policy, which has provisioned for an 80-strong Vickers/Rolls-Royce fleet of Viscounts and Vanguards to be in service by 1960/61. So far no B.E.A. decision on a short-haul jet—a subject discussed on pages 578-580—has been made, though it is now widely known that Bristol have in their Model 200 a jet-transport project designed primarily for short-haul operations. The Corporation freely admits its lack of enthusiasm for the jet, which must, it considers, fall 15 per cent short in economy of the best turboprop, which in B.E.A.'s view is the Vanguard. Nevertheless, in common with others, B.E.A. is well aware of the possibility that jet competition will in due course come to be keenly felt on international short-haul routes, and they are planning accordingly to meet such competition with a specially designed vehicle.

Lord Douglas (left), the chairman, and Mr. A. H. Milward, chief executive.

Board Members of B.E.A. are: Lord Douglas of Kirtleside, chairman; Sir John Keeling, deputy chairman; A. H. Milward, chief executive; Lord Balfour of Inchrye; S. Kenneth Davies (chairman of the Welsh Advisory Council for Civil Aviation); Sir Patrick Dollan (chairman of the Scottish Advisory Council); W. A. Edmenson (chairman of the Northern Ireland Advisory Council); Sir Arnold Overton; A. C. Ping.

Fleet: 25 Viscount 701, 13 Viscount 802, 19 Elizabethan, 38 DC-3 Pionair, three Rapide, eight Douglas C-47 Pionair-Leopard convertible passenger freighter, three Heron, one Bristol Freighter (leased to Silver City Airways), three Westland S-55, one Bristol 171, one Bell 47B3. On order: 11 Viscount 802, 14 Viscount 806, 20 Vanguard.

Operating Results for the year ended December 31, 1956: 2,436,000 passengers; 21,604 short tons of freight and 7,476 short tons of mail carried; 87,114,548 load ton-miles flown; total revenue, £23,367,000; 10,407 staff.

Headquarters: Keyline House, South Ruislip, Middlesex.

"Flight" photograph

One of Airwork's five Hermes 4As—the most modern of the big transports operated by British private enterprise.

BRITISH PRIVATE-ENTERPRISE OPERATORS

THIRTY COMPANIES PROVIDING SCHEDULED AND CHARTER SERVICES

Air Charter.—Channel Air Bridge services for vehicles and for supplementary passengers and freight, Southend to Calais, Ostend and Rotterdam. Trooping to Cyprus, and long term contract airfreighting to Australia, and general passenger and freight charters. Head office, 21 Wigmore Street, London, W.1. Main bases, Southend and Stansted, Essex. Executives, F. A. Laker (managing director), Capt. E. N. Jennings (chief pilot and operations manager), G. W. Forster (commercial manager), D. A. Whybrow (manager—Channel Air Bridge services), A. F. Nickalls (chief accountant). Fleet: six Avro York Supertraders, three Bristol Freighter 170 Mk. 31, six Bristol Freighter 170 Mk. 32, three Douglas DC-4. In the 12 months ending September 30, 1956, Air Charter carried 163,988 passengers, 29,808 short tons of freight, and flew 12,694,075 revenue short ton statute miles.

Air Couriers (Transport).—Operators of general charter and press and television flying. Head office, Croydon Airport, Surrey. Main base, Croydon. Executives: C. P. L. Gogsal, F. W. Griffith (directors) and K. J. Kelly (chief engineer). Fleet: two Rapide and two Gemini.

Air Kruise (*British Aviation Services Group*).—Scheduled passenger, inclusive tour and charter services. Head office, Lydd (Ferryfield) Airport, Romney Marsh, Kent. Main base, Lydd (Ferryfield). Scheduled routes: Lydd to Lyons (Blue Arrow Service); Lydd to Le Touquet, Calais, Ostend and Jersey. Inclusive tours: Lydd to Basle, Lyons, Nice, Luxembourg, Toulouse, Perpignan, Palma and Jersey; Manchester to Ostend, Luxembourg and Stavanger. Fleet: six Dakota and four Bristol Wayfarer. On order: six Handley Page Herald. In 1956 Air Kruise carried 68,750 passengers, 350 short tons of freight, and flew 1,350,081 revenue short ton statute miles.

Air Navigation and Trading.—Contract charter services and flying training. Head office, Squires Gate Airport, Blackpool. Main bases, Blackpool and Middleton. Executives: R. L. Whytham (chairman and chief engineer), G. C. S. Whytham (operations manager), Capt. T. J. Franks (chief pilot), E. Minshaw (C.F.I.) and W. R. MacPherson (chief inspector). Fleet: two Avro 19, four Anson, two Rapide, two Dragon, six Auster, four Tiger Moth and three Proctor. On order, one D.H. Otter. In 1956 Air Navigation and Trading carried 18,000 passengers (estimated).

Airviews.—Scheduled passenger services, charter and pleasure flights and aerial photography. Head office, Manchester Airport, Wythenshawe, Manchester. Main base, Manchester. Executives: J. B. Martin and B. M. Martin. Scheduled routes: Manchester-Southampton-Isle of Wight and Manchester-Newquay. Fleet: one Dove, two Rapide and one Auster. In 1956 Airviews carried 3,300 passengers and 300 short tons of freight (estimated figures).

Airways Union.—The company controls subsidiaries engaged in the manufacture and repair of aircraft and components and the operation of airports, flying clubs, charter services and flying schools. Head office, The Airport, Weston-super-Mare, Somerset. Main bases, Weston-super-Mare, Exeter and Plymouth. Executives: R. King-Farlow (chairman), S. J. Cox (secretary and general manager), F. G. Jeans, R. J. B. Pearse and T. F. Allen. Fleet: one Gemini, three Auster, five Tiger Moth and one Miles Messenger. In 1956 Airways Union carried 4,759 passengers.

Airwork.—Operators of scheduled overseas passenger services, long-term contract flying and trooping services. Head office, Airwork House, 35 Piccadilly, London, W.1. Main bases, London Airport and Blackbushe. Senior executives: M. D. N. Wyatt (chairman and managing director), R.Loudon Cumming (director and secretary), Hon. W. K. Davison (general manager), L. R. E. Castlemaine (sales manager), G. E. Ford (operations manager), K. R. Sangster (traffic manager), W. W. Warner (chief engineer). Scheduled routes: Colonial-coach services from London to Nairobi, Salisbury and Accra with intermediate traffic rights on each route. Fleet: five Hermes, seven Viking and ten DC-3 (the latter operated by Transair). In 1956 Airwork carried 33,163 passengers, 28,922 short tons of freight and 2.7 short tons of mail, and flew 2,658,588 revenue short ton statute miles on scheduled services and 13,056,818 revenue short ton statute miles on non-scheduled services.

Aquila Airways (*British Aviation Services Group*).—Scheduled flying-boat passenger services, inclusive tour, charter and trooping work. Head office, 1 Great Cumberland Place, London, W.1. Main base, Southampton. Executives: Eoin C. Mekie (chairman), A. Cdre. G. J. Powell (managing director) and R. J. Clark (manager). Scheduled routes: Southampton-Lisbon-Madeira-Canary Islands, Southampton-Lisbon-Canary Islands, Southampton-Marseilles-Capri/Ischia, Southampton-Genoa and Santa Margherita and Southampton-Marseilles-Genoa. Fleet:

A Bristol Freighter of Air Charter takes aboard a lorry-load of agricultural machinery—including the lorry.

One of Dan-Air's two Dakotas; 43 of this faithful type are owned by Britain's independent operators.

BRITISH PRIVATE-ENTERPRISE OPERATORS...

three Short Solent. In 1956 Aquila carried 16,517 passengers, 27 short tons of freight and 50 short tons of mail, and flew 9,255,512 revenue short ton statute miles.

Autair (*Helicopters*).—All types of helicopter operation, survey, freight, passenger, pest-control, publicity, aerial film and photography. Antarctic detachment—1955/6 Grahamland Expedition. Head office, 75 Wigmore Street, London, W.1. Main base, Croydon. Executives: W. H. Armstrong (managing director), Capt. L. R. Lord (chief pilot) and T. Howie (chief engineer). Fleet: three Sikorsky S-51, one Bell 47G-2.

B.K.S. Air Transport—Scheduled passenger and freight services, charter and trooping work. Head office, 1 Marylebone High Street, London, W.1. Main bases, Southend, Newcastle and Leeds. Executives: J. W. Barnby and C. J. Stevens. Scheduled routes: Newcastle and/or Leeds to Jersey, Isle of Man, Isle of Wight and Ostend, Southend to Leeds and Leeds to Belfast, Southend to Bilbao, Leeds to London Airport, Leeds to Glasgow and/or Edinburgh, Edinburgh to Belfast, Newcastle to Dublin and Dublin to Belfast. Inclusive tours based on Southend to Corsica, Majorca, Corsica and Majorca, Malaga, Oporto; Newcastle-Lourdes-Newcastle, Leeds-Lourdes-Leeds. Fleet: five Dakota and two Viking. In 1956 B.K.S. carried 60,953 passengers and 315 short tons of freight.

Britavia (*British Aviation Services Group*).—Operators of air trooping, inclusive tour and world-wide passenger and freight charter services. Head office, 1 Great Cumberland Place, London, W.1. Main base, Blackbushe. Executives: Eoin C. Mekie (chairman), A. Cdre G. J. Powell (managing director), Colonel J. H. Willink (manager, Hermes division). Fleet: five Hermes IVA. In 1956 Britavia carried 33,477 passengers and flew 9,187,557 revenue short ton statute miles.

British Aviation Services Group.—*See* Air Kruise, Aquila Airways, Britavia, Lancashire Aircraft Corporation, Manx Airlines, and Silver City.

Cambrian Airways.—Scheduled passenger services, charter and Army co-operation flights. Head office and base, Rhoose Airport, Cardiff, Wales. Executives: J. H. Watt (chairman), W/C. L. B. Elwin and W. W. Stanley (joint managing directors), B. J. T. Callan (commercial and operations manager), G. A. Perrott (chief pilot) and R. H. Boutcher (chief engineer). Scheduled routes: Liverpool to Cardiff-Bristol-Jersey-Guernsey; Cardiff to Paris-Jersey-Guernsey-Haverfordwest-Liverpool-Southampton; Bristol to Paris-Jersey-Guernsey-Liverpool-Southampton; Cheltenham/Gloucester to Paris-Jersey-Guernsey; Southampton to Paris-Bristol-Cardiff; Cardiff, Bristol and Southampton to Nice; Southampton-Dinard; Cardiff-Bristol-Belfast. Additional routes approved by the M.T.C.A. for future operation: Haverfordwest-Swansea-Cardiff-London and Haverfordwest-Dublin (provisional approval). Fleet: two Dakota, three Dove, three Heron, two Rapide, three Proctor and one Auster. In 1956 Cambrian carried 49,900 passengers and 336 short tons of freight.

An Autair Bell 47G-2 being loaded aboard a Hunting-Clan York for shipment to Africa. Only the rotor is dismantled.

Channel Airways (*East Anglian Flying Services*).—Scheduled passenger and charter services. Head office, Southend Airport. Main bases, Southend, Ipswich, Shoreham and Portsmouth. Executives: S/L. R. J. Jones (managing director) and A. E. Hugo Parsons (director-operations). Scheduled routes: Ipswich-Southend-Rochester-Shoreham-Paris; Ipswich-Southend-Rochester-Shoreham-Channel Islands; Ipswich-Southend-Ostend; Portsmouth-Shoreham-Paris; Portsmouth-Channel Islands; Shoreham-Portsmouth-Isle of Wight and Ipswich-Southend-Rotterdam. Fleet: two Bristol Wayfarer, five Dove, two Rapide, two Proctor, one Tiger Moth and two Auster. In 1956 Channel Airways carried over 17,000 passengers and 200 short tons of freight.

Dan-Air Services.—Passenger and freight charter, scheduled and inclusive tour services. Head office, 36/38 New Broad Street, London, E.C.2. Main operating base, Blackbushe; maintenance and engineering base, Lasham Airfield. Executives: F. E. F. Newman, J. W. Davies, E. O. Wallis (directors), A. F. Austin (secretary), L. E. Moore (general manager). Fleet: four York, two Dakota.

One of Eagle's all-Viking fleet of 18 aircraft.

Derby Aviation.—Scheduled air services, inclusive tours and passenger and freight charters. Flying training (to commercial licence standards and instructors' courses). Aerial photography and survey. Aircraft sales, modifications, overhauls, repairs and maintenance. Head office, 78 Buckingham Gate, London, S.W.1. Main bases, Derby and Elstree. Executives: G/C. C. A. B. Wilcock (chairman), J. Harben-Grice, W/C. H. A. Roxburgh, E. W. Phillips, R. R. Paine (directors), A. C. Felts (secretary), E. W. A. Lines (chief pilot), K. W. Felts (chief engineer), F. Marshall (chief inspector). Scheduled routes: Derby to Jersey, Isle of Man, Glasgow, and Birmingham/Ostend. Inclusive tour services from Birmingham and Blackbushe. Fleet: two Dakota, two Marathon, one Anson, one Rapide; light aircraft for charter and photography. In 1956 Derby Aviation carried 12,560 passengers.

Don Everall (Aviation).—Operators of scheduled services, charter and aerial photography, advertising, ambulance services and inclusive tours to the continent. Head office, Elmdon Airport, Birmingham. Main base, Wolverhampton Airport. Executives: D. Everall and C. Everall (directors), A. D. Atkinson (operations manager) and E. Holden (chief engineer). Scheduled routes: Birmingham-Leicester East-Coventry-Jersey-Guernsey; Coventry-Wolverhampton-Ronaldsway; Birmingham-Isle of Wight. Fleet: one Dakota, three Rapide, one Messenger, three Auster. In 1956 Don Everall carried 7,851 passengers (5,751 on scheduled and 2,100 on non-scheduled services) and flew 250,000 revenue short ton statute miles on their scheduled services.

Eagle Airways.—Operators of scheduled passenger services. Head office, Marble Arch House Air Terminal, 40 Edgware

Road, London, W.2. Main base, London Airport. Executives: H. Bamberg (chairman and managing director), A. R. Bamberg, N. Ashton-Hill (directors), W. T. Rodger (general sales manager). Scheduled routes: London to Luxembourg, Innsbruck, La Baule/St. Nazaire, Saragossa, Dinard, Jersey, Perpignan, and two Air/Coach services to Switzerland and the Costa Brava; Manchester to Hamburg and Copenhagen and an Air/Coach service to Switzerland. Projected services Manchester to Brussels, Ostend, Frankfurt, Munich and Vienna. Fleet: 18 Viking. (**Eagle Aviation** are operators of charter and trooping flights.) In 1956 Eagle Airways carried 4,400 passengers and flew 119,767 revenue short ton statute miles; Eagle Aviation carried 98,809 passengers.

Fison-Airwork.—Operators of helicopters for all forms of agricultural and industrial work and for passenger or freight charters. Head office, Bourn, Cambridge. Main base, Bourn. Executives: M. D. N. Wyatt (chairman), J. E. Harper, L. A. Lafone, W. J. F. McEwen, W. E. Ripper, G. E. Wildman-Lushington (directors), and A. G. Wormald (secretary). Fleet: nine Hiller and four Westland Whirlwind. Activities in 1956 included co-operating in oil exploration in Nigeria; assisting in gas pipe line maintenance and construction in Pakistan; crop spraying and spraying demonstrations in the U.K.; pilot training; executive charter; Banana spraying in Jamaica. Associated companies overseas undertook cotton spraying and locust control in the Sudan; locust control, malaria control and crop spraying in East and South Africa; and agricultural work in Queensland.

Hunting-Clan Air Transport.—Scheduled passenger and cargo services, trooping and general charter work. Head office and main base, London Airport, Hounslow, Middlesex. Executives: M. H. Curtis (managing director), E. H. Baker (secretary), Capt. L. B. Greensted (technical director), D. J. Platt (commercial manager), J. Robinson (sales manager), E. P. Hessey (manager, Africa), G. B. Mollet (traffic manager), A. F. Dedman (chief accountant), L. V. E. Atkinson (station manager), Capt. R. W. L. Mulliner (chief pilot and operation superintendent), H. B. Cundall (development engineer). Scheduled routes: London-Gibraltar; London-Nairobi *via* Malta, Wadi Halfa, Khartoum and Entebbe; London-Salisbury *via* Malta, Wadi Halfa, Khartoum, Entebbe, N'Dola and Lusaka; London-Accra *via* Tangier, Villa Cisneros, Dakar, Bathurst and Freetown; "Africargo" all-cargo services between the United Kingdom and East and Central Africa. Fleet: three Viscount (on lease to Middle East Airlines), nine Viking, five Dakota and four York. On order: two Britannia 310, with an option on another; two DC-6A. In 1956 Hunting-Clan carried 34,032 passengers and 471 short tons of freight and mail; and flew approximately 8,260,500 revenue short ton statute miles. (See page 604 for African affiliated company.)

Jersey Airlines.—Scheduled passenger services and charter flights. Head office, 4 The Parade, St. Helier, Jersey, Channel Islands. Main base, Jersey. Executives: M. L. Thomas (chairman and managing director), B. W. Gardiner, T. C. Chandler, R. L. Weir (directors), J. S. Cunningham (secretary). Scheduled routes: Channel Islands to London, Southampton, Bournemouth, Paris, St. Brieuc, Bilbao, Exeter, Manchester, Dinard, Nantes, Cherbourg. Fleet: seven Heron, one Bristol Wayfarer, two Rapides. In 1956 Jersey Airlines carried 159,174 passengers, 304 short tons of freight and 15 short tons of mail and flew 1,256,573 revenue short ton statute miles.

Lancashire Aircraft Corporation (*British Aviation Services Group*).—Scheduled passenger services, freight and charter work, coach/air and rail/air passenger services. Head office: Blackpool Airport, Blackpool, Lancashire. Main base, Blackpool. Executives: Eoin C. Mekie (chairman), A. Cdre. G. J. Powell (managing director), Air Vice Marshal S. D. Macdonald (director), R. V. Baker (general manager). Scheduled routes: Blackpool-Isle of Man; Leeds-Isle of Man; Birmingham-Isle of Man; Leeds-Jersey; Blackpool-Jersey. Fleet: two Bristol 170, two Dakota, one Heron I, one Rapide, one D.H.86A. In 1956 Lancashire Aircraft Corporation carried 62,208 passengers and 299 short tons of freight, and flew 767,290 revenue short ton statute miles.

Manx Airlines (*British Aviation Services Group*).—Scheduled services for passengers and freight; coach-air passenger services; ambulance and short- and long-range charter flights. Head office, Ronaldsway Airport, Ballasalla, Isle of Man. Main base, Ronaldsway. Executives: Eoin C. Mekie (chairman), G. S. Hankinson (managing director), A. Cdre. G. J. Powell, G. H. Drummond and T. L. Vondy (directors). Scheduled routes: Isle of Man to Glasgow, Edinburgh, Carlisle and Newcastle; Glasgow-Belfast and Ronaldsway. Fleet: two Bristol 170, one Heron I, one Rapide. In 1956 Manx Airlines carried 23,784 passengers and 128 short tons of freight.

Morton Air Services.—Operators of scheduled passenger services, charter and air ambulance flights. Head office, Croydon Airport, Surrey. Main base, Croydon. Executives: T. W. Morton (managing director), J. J. Fargher (secretary), P. Eskell (commercial manager) and T. Gunn (chief pilot). Scheduled routes: Croydon to Jersey, Guernsey, Le Touquet and Rotterdam. Fleet: four Dove, three Consul and one Rapide. In 1956 Morton Air Services carried 20,000 passengers.

A Solent flying-boat of Aquila at Genoa. The company is associated with the British Aviation Services Group.

Olley Air Service.—Scheduled passenger services, charter and air ambulance. Head office, Croydon Airport, Surrey. Main base, Croydon. Executives: T. W. Morton (chairman), S. A. Carter (secretary and commercial manager) and T. Gunn (chief pilot). Scheduled routes: Croydon to Jersey/Guernsey to race meetings. Fleet: three Dove, two Consul and three Rapide. In 1956 Olley Air Service carried 14,000 passengers.

Scottish Airlines.—Scheduled services and charter trooping. Head office, Prestwick Airport, Ayrshire. Main bases, Prestwick and Stansted. Executives: I. C. Grant (general manager), D. McConnell (secretary), W. A. Wilkinson (technical manager), and W. M. Cummings (London manager). Scheduled routes: Prestwick-Ronaldsway. Fleet: three York and one Dakota. On order: six Prestwick Twin Pioneers. In 1956 Scottish Airlines carried 16,660 passengers and 1,643 short tons of freight.

Silver City Airways (*British Aviation Services Group*).—Operators of scheduled vehicle ferries, passenger services, helicopter freight services, charter and trooping flights and livestock transportation. Head office: 1 Great Cumberland Place, London, W.1. Bases, Ferryfield, Blackbushe, Southampton and Newtownards. Executives: Eoin C. Mekie (chairman), A. Cdre. G. J. Powell (managing director), A.V-M. S. D. Macdonald (deputy managing director), W. G. Franklin, S. A. Tennant, E. Manley Walker (commercial manager, air ferries) and L. R. Pavey (commercial manager, freight and charter). Scheduled routes: Ferryfield to Ostend, Calais and Le Touquet; Southampton-Cherbourg, Deauville, Jersey and Guernsey; Belfast-Stranraer, Ronaldsway and Stranraer-Ronaldsway. Fleet: 14 Bristol Superfreighter, eight Bristol Freighter, Rapide, Consul, etc. In 1956 Silver City carried 135,709 passengers, carried 69,474 short tons of freight, and flew 4,525,644 revenue short-ton statute miles. **Silver City (Northern) Aviation** (late Dragon Airways) operate scheduled passenger services, freight services and inclusive tour services from Woolsington Airport, Newcastle-upon-Tyne, Northumberland.

Skyways.—All aeronautical services; operators of scheduled passenger services, charter, trooping and pleasure flights. Head

Bristol Freighters owned by the Isle of Man operator Manx Airlines—a sister company of Silver City Airways.

Government stores for Cyprus are seen here being loaded aboard one of Skyways' 15 Yorks.

BRITISH PRIVATE-ENTERPRISE OPERATORS...

office: 7 Berkeley Street, London, W.1. Main base, Stansted. Executives: Sir Wavell Wakefield, M.P. (chairman), Eric Rylands (managing director), Charles F. Dickson, Derek J. Bibby, Leslie O'B. Harding (directors), A. J. Henderson (secretary), J. M. Twiss (general manager—administration), H. P. Snelling (general manager—commercial), E. Barker (general manager—financial), A. Cdre. S. W. Smith (air trooping executive) and Mrs. E. Whittaker (head of public relations and assistant to managing director). Scheduled routes: Crusader service, United Kingdom-Cyprus and Malta-Cyprus; Continental Coach/Air services London-Lympne-Beauvais-Paris, London-Lympne-Lyons-Nice. Fleet: nine Hermes, 15 York, three Dakota, four twin- and single-engined aircraft. In 1956 Skyways carried 91,928 passengers and 997 short tons of freight, and flew 1,211,900 revenue short ton statute miles.

Starways.—Operators of scheduled services, inclusive tours and general charter work. Head office, Liverpool Airport, Liverpool, 19. Main base, Liverpool. Executives: F. H. Wilson (chairman), J. A. Wilson (director), L. Crompton (chief inspector) and J. M. Kent (traffic manager). Scheduled routes: Liverpool-London, Glasgow-Jersey; inclusive tours to Lourdes, San Sebastian, Santander, and Barcelona, out of Liverpool, Manchester, Birmingham and Glasgow. Fleet: four Dakota. In 1956 Starways carried 27,513 passengers and flew 704,177 revenue short ton statute miles.

Transair.—Scheduled passenger services, mail, freight and charter. Head office, Croydon Airport, Surrey. Main base, Croydon. Executives: G. H. Freeman (chairman and managing director), C. Nunn (supplies controller), H. S. Perren (commercial manager), C. W. H. Bebb (operations manager), D. L. Brooks (chief engineer), W. A. Richardson (chief inspector), S. G. Webster (chief pilot) and D. J. Spurgeon (public relations). Scheduled passenger services: Croydon to Jersey and Minorca; inclusive tours from Croydon to Lourdes, Perpignan, Alghero, and Dusseldorf; scheduled newspaper and mail routes: Croydon to Paris, Jersey and Guernsey, Dusseldorf, Hanover and Frankfurt. Fleet: ten Dakota, two Viscount 800 (due for delivery at midsummer this year).

CIVIL AIR ORGANIZATIONS (continued from page 586)

charts; dimensional units for communications; operation of aircraft; aircraft nationality and registration; airworthiness; facilitation; telecommunications; traffic services; search and rescue; accident inquiry; aerodromes; aeronautical information services.

I.C.A.O. is also responsible, through the medium of Regional Air Navigation Conferences, for drafting and supervising the "regional plans" which specify the air navigation services and facilities required in the world's flying regions.

In the economic field, the organization is interested in the facilitation of air travel by simplification of Customs, immigration, and health procedures and in the legal field it is responsible for the drafting of international air law conventions, including the Geneva (1948) and Rome Conventions (1952), and the Amendment Protocol (1955) to the 1929 Warsaw Convention.

As a United Nations Specialized Agency, I.C.A.O. participates in a programme of technical assistance to underdeveloped countries, and maintains some twenty missions.

PRESIDENT OF THE COUNCIL, Walter Binaghi; SECRETARY-GENERAL, E. C. R. Ljunberg. ADDRESS: International Aviation Building, Montreal 3, Canada.

International Federation of Air Line Pilots' Associations. I.F.A.L.P.A. (now representing 16,500 members of 27 pilots' associations), was founded in London in 1948 with the objects of "providing a democratic body capable of presenting to international organizations pilot opinion in the aviation fields of conditions of service, international legislation, technical development and standards of safety; to provide a forum for discussion among pilots on all matters of common interest; to facilitate the exchange of information and advice on technical and labour problems; to advance the professional status of the pilot by encouraging progress in his technical standards, and to foster goodwill and comradeship among the pilots of the world." Particular emphasis is placed upon putting the pilots' views at regional, divisional and special meetings of I.C.A.O.

PRESIDENT, C. N. Sayen (A.L.P.A.); SECRETARY, D. Follows, M.B.E., B.A. ADDRESS: 95 Mount Street, London, W.1. TECHNICAL SECRETARY, Captain C. C. Jackson. ADDRESS: 6 Cavendish Square, London, W.1.

International Federation of Independent Air Transport. F.I.T.A.P. (from the initials of its French title) is an organization of independent companies and national associations of companies formed to secure measures of freedom and opportunity for independent airlines and to foster and protect the interests of private enterprise in civil aviation.

PRESIDENT, Ludwig G. Braathen; SECRETARY GENERAL, J-M. Riche. ADDRESS: 43 Rue de la Chausee d'Autin, Paris IX.

International Society of Air Travellers and Air Transport Users. This is a new Society, formed in March this year. Its objects are to care for the interests of air travellers and air transport users by attaining the abolition of unnecessary delays and restrictions; to attain the abrogation of certain "vexatious" national and international legislation; to represent the views of air travellers and users; and to popularize air travel.

PRESIDENT, Lord Brabazon of Tara; CHAIRMAN, Mr. Cecil Turner. ADDRESS: Park Lane House, 45 Park Lane, London, W.1.

Ministry of Transport and Civil Aviation. The M.T.C.A. came into being in October 1953, when the Ministry of Civil Aviation was amalgamated with the Ministry of Transport. It is responsible in the United Kingdom for the provision and administration of State-controlled aerodromes and ground services; the regulation of civil flying; accident investigation; the adoption in the U.K. of the standards and practices recommended by I.C.A.O.; and the negotiation of international agreements.

The M.T.C.A. also embraces the Air Safety Board (chairman, Air Marshal Sir Charles Guest, K.B.E., C.B.), a small body of experts who advise the Minister on appropriate points.

MINISTER OF TRANSPORT AND CIVIL AVIATION, The Rt. Hon. Harold Watkinson, M.P.; PARLIAMENTARY SECRETARY (CIVIL AVIATION), Mr. Airey Neave, D.S.O., O.B.E., M.C., M.P.; PERMANENT SECRETARY, Sir Gilmour Jenkins, K.C.B., K.B.E., M.C. ADDRESS: Berkeley Square House, Berkeley Square, London, W.1.

Society of British Aircraft Constructors. Though primarily concerned—as the aircraft industry's representative body and official spokesman—with research, design, development and production of both military and civil aircraft, the S.B.A.C. performs a number of services specifically of value to air transport as such. Among these is the promulgation of various standards, including the well-known S.B.A.C. standard method of estimating direct operating costs of civil aircraft.

Other activities of the Society—which has some 600 member-firms—include statistical and information work covering many aspects of aviation and in particular the potentialities of the export trade. The S.B.A.C. is also responsible for the annual Farnborough Air Display and Exhibition.

DIRECTOR, E. C. Bowyer, C.B.E.; ASSISTANT DIRECTORS, H. W. Goodinge, R. E. Leete; SECRETARY, R. T. Hughes. ADDRESS: 29 King Street, London, S.W.1.

Society of Licensed Aircraft Engineers. The S.L.A.E. is constituted to cater for "all categories of professional aircraft engineers in civil and Service aviation concerned with the servicing, maintenance, overhaul and repair of aircraft, aero-engines and ancilliary equipment"—including those not required to hold licences. A major part of the Society's work is devoted to the education, qualification and advancement of the professional aircraft engineer.

PRESIDENT, A. C. Jack, A.M.I.Mech.E., A.S.L.A.E.; CHAIRMAN, M. T. Holdham; GENERAL SECRETARY, P. F. Murray. ADDRESS (Secretariat): 1 High Street, Maidenhead, Berkshire.

WORLD AIRLINE DIRECTORY

OPERATIONS, FLEETS AND MANAGEMENTS OF INTERNATIONAL AND DOMESTIC CARRIERS

IN the following 24 pages is a *Flight* compilation of the salient facts concerning over 250 of the world's air transport operators. For quick reference the companies are listed in alphabetical order. Traffic and fleet statistics are the most up-to-date available. British operators are dealt with separately in the preceding pages (B.O.A.C., p. 587; B.E.A., p. 588; independent operators p.589).

Aaxico Airlines, Inc., took its present name on December 31, 1956, having previously worked as American Air Export and Import Company. The company is an all-cargo carrier flying scheduled services between New York and New Orleans, and between New Orleans and Detroit. Cities served are:—Philadelphia, Baltimore, Washington, Richmond, Atlanta, Birmingham, Louisville, Indianapolis, Chicago, Cincinnati, Columbus and Cleveland.
Head Office: Miami, Florida, U.S.A.
Executives: Howard J. Korth, president and general manager; E. P. Odenwalder, secretary/treasurer; J. G. Helvey, vice-president; Oliver F. Stern, vice-president cargo sales (New York).
Fleet: three C-46F.
Results for year ended December 31, 1956: 163,622 kg of freight, 4,707 kg of mail and 49,345 kg of express carried; total costs, £41,174; total revenue, £19,054; 52 staff.

Aden Airways, Ltd., a wholly owned subsidiary of B.O.A.C., operate local services and international routes ranging from Cairo and Damascus in the north to Nairobi in the south. The company was incorporated on March 1, 1949, and became self-accounting under its own board of directors on October 1 of that year.
Head Office: Khormaksar, Aden.
Executives: S. Broad, general manager; L. Bennett, commercial manager; R. Haseldine, secretary/accountant.
Fleet: seven DC-3, one D.H.89.
Results for year ended March 31, 1955: 21,505 passengers; 1,952 tons of freight and 87 tons of mail carried; 1,510,171 ton-miles flown; total costs, £714,055; total revenue, £713,145; 300 staff.

Aer Lingus, Teoranta, the Irish national airline, began operations in 1936 with a D.H.84, which was used on the Dublin-Bristol route. The company now operates a fleet of Viscounts and DC-3s on routes linking Ireland with Britain, Holland, Belgium, France, Spain and Germany. A new route to Switzerland and Italy will be opened in June. Under an agreement signed last year, B.E.A. holds 10 per cent of the shares of Aer Lingus and co-operates with the company on certain routes between the United Kingdom and Ireland.
Head Office: Dublin, Republic of Ireland.
Executives: P. Lynch, chairman; J. F. Dempsey, general manager; Capt. J. C. Kelly-Rogers, deputy general manager; M. Stuart-Shaw, asst. general manager; Capt. W. J. Scott, operations manager; O. Hone, traffic manager; J. Gorman, secretary.
Fleet: four Viscount 707, 13 DC-3. On order: three Viscount 808 (1957), five Friendship (1958).
Results for year ended December 31, 1956: 448,789 passengers; 4,607,753 kg of freight and 1,590,396 kg of mail carried; 15,789,566 ton-km flown; total costs 1955/56, £2,488,026; total revenue 1955/56, £2,612,623; 1,690 staff.

Aeroflot-Grazdanskij Wozdusnyj Flot is the Soviet airline, but it is not truly comparable with the airlines of the West, as in addition to operating passenger, freight and mail services, it is responsible for all aspects of civil aviation. Among its many activities are agricultural, survey and ambulance flying. In 1929 the pioneer Soviet airlines were amalgamated to form Dobrolet, which in 1932 was reorganized and became Aeroflot. The airline now operates an extensive route network within the U.S.S.R.

"Flight" photograph

Three of Aeroflot's Tu-104 turbojet airliners seen on a visit to London Airport. This type is in service on the Prague-Moscow-Peking route. Three have been ordered by Czechoslovak Airlines.

WORLD AIRLINE DIRECTORY . . .

(reported to total 230,000 route miles), routes to neighbouring Communist countries and to Pekin, Stockholm, Copenhagen, Helsinki and Kabul. Ju-104s are in service on a number of routes including Pekin-Moscow-Prague.
Head Office: Moscow, U.S.S.R.
Executives: Marshal P. F. Zhigarev, director general; Lt. Gen. N. A. Zakharov, deputy director general.
Fleet: Tu-104, Il-14, Il-12, Li-2, An-2, Po-2, Il-20, Yak 12R and other types. Il-20 turbojet-powered aircraft may still be operating domestic mail and freight services.

Aerolineas Argentinas-Empresa del Estado., or Argentine Airlines as it is more generally known, was founded as a state corporation in May 1949 by the Ministry of Transport to take over the operations of FAMA, ALFA, Aeroposta and ZONDA. The airline maintains a domestic network and international services to neighbouring South American countries, Cuba, the U.S.A. and Europe.
Head Office: Buenos Aires, Argentina.
Executives: A. E. Llavallol, chairman; Vice Comodoro A. Becher, vice-chairman; J. Carlos Mason Lugones, general manager; D. P. Albano, operations manager; G. A. Zalazar, economic planning manager.
Fleet: six DC-6, five DC-4, four Convair 240, 16 DC-3, seven Sandringham.
Results for year ended December 31, 1955: 327,808 passengers; 1,532,859 kg of freight and 492,577 kg of mail carried; total ton-km flown 39,087,756; total costs, £7,900,873; total revenue, £4,958,723; 5,623 staff.

Aerolineas Mexicanas S.A., is operating domestic services linking Mexico City with Zihuatanejo, Acapulco, Leon, San Luis Potosi, Saltillo, Monclova and Piedras Negras.
Head Office: Mexico City, Mexico.
Fleet: DC-3.
No other details available.

Aéromaritime—see Union Aéromaritime de Transport.

Aeronaves de Mexico, S.A. was founded on September 1, 1934, and began operating between Mexico City and Acapulco. Its early fleet consisted of a three-engined Stinson, three Bellanca Pacemakers and a Fairchild 24. The airline now has a route network of about 6,500 miles within Mexico. In 1952 Aeronaves bought LAMSA (founded in 1934) from United Air Lines and in 1954 the company also acquired Aerovias Reforma, which had been founded in 1945.
Head Office: Mexico City, Mexico.
Executives: A. D. Lombardo, president; C. Ramos, general manager; R. L. Johnson, operations manager.
Fleet: 15 DC-3, three DC-4, four Convair 340, Constellation.
Results for year ended December 31, 1954: (*including Aerovias Reforma*). 213,248 passengers; 1,700 tons of freight and 195 tons of mail carried; about 1,500 staff. Other details not available.

Aero-Nord Sweden A.B., operates scheduled newspaper and limited passenger services within Sweden.
Head Office: Stockholm, Sweden.
Executives: P-S. Holmström, managing director.
Fleet: one Lodestar, one Oxford.
Staff 19. No other details available.

One of the fleet of Curtiss C-46s used by Aaxico Airlines on their scheduled freight services.

Aeronorte—Empresa de Transportes Aereos Norte do Brasil, S.A., began operations in 1950 and operates a network of feeder services in the north-east of the country. Percival Prince aircraft were used originally but the present schedules are worked by DC-3s. In 1953 Real acquired control of the company but Aeronorte works as a separate division. By early 1955 the Aeronorte route mileage exceeded 4,000 miles.
Head Office: Sao Luiz, Brazil.
Executives: Commandante L. Gomes, president; N. Freire, general manager.
Fleet: four DC-3.

Aero O/Y—Finnair was founded in 1923 and began operations, with single-engined Junkers-F13 floatplanes, in 1924. Landplane operations began in 1936 when airports became available. After the war Aero O/Y developed its European routes which culminated in the opening of a service to London in 1954. The Finnish internal network is one of the most extensive in Europe, fares are very low and the growth of traffic in recent years has been phenomenal. The company has an extremely high reputation for regularity and punctuality.
Head Office: Helsinki, Finland.
Executives: L. Grandell, president; B. Aulin, vice-president (technical; A. Nyström, vice-president commercial.
Fleet: two Convair CV-440, three Convair CV-340, nine DC-3. On order: one CV-440.
Results for year ended December 31, 1956: 333,066 passengers; 1,657,351 kg of freight and 566,210 kg of mail carried; 24,010,014 ton-km flown: total costs, £2,838,518; total revenue, £2,864,261; 1,083 staff.

Aerotaxi—see Aérovias Nacioñales de Colombia.

Aero Transportes., S.A.—ATSA. Founded in 1943 and began scheduled services in 1944. Services were suspended in the following year and resumed in January 1947. The company now operates a return service on weekdays between Monterrey and Brownsville/Matamoros.
Head Office: Mexico City, Mexico.
Executives: R. O'Farrill, president; H. J. Filshinger, general manager; J. P. Centella, sales manager.
Fleet: DC-3.
Traffic statistics not available.

Aerovias Ecuatorianas C.A. (AREA), was founded in 1949 and began operations in 1951. AREA took over the routes formerly worked by Aero Transporte Ecuatoriano and Transandia Ecuatoriana. The company is believed to be operating an internal route network but no recent news is available.
Head Office: Quito, Ecuador.
Executives: L. Arias, president; A. Arias, general manager.
Fleet: Boeing Stratoliner, DC-3, Anson, Navion. On order: one Friendship (1958).

Aérovias Nacioñales de Colombia — AVIANCA claims to be the oldest airline in the Americas—and, in fact, it was formed (in 1940) as the result of a merger of S.C.A.D.T.A. (founded in 1919) and Servicio Aereo Colombiano. S.C.A.D.T.A. was founded by German interests but in 1931 Pan American Airways acquired an 80 per cent interest—which was, however, reduced to 64 per cent at the time of the merger. The company operates domestic services and services to Venezuela, Ecuador, Jamaica, the U.S.A., Bermuda, Portugal, Spain, France and Germany. In 1951 Avianca acquired the second largest Colombian airline LANSA and in 1952 also took over SAETA. A wholly owned subsidiary, Aerotaxi Ltda, operates Cessna 195 and Beaver aircraft to areas which cannot be served by larger aircraft.
Head Office: Bogotá, Colombia.
Executives: J. G. R. Jaramillo, president; J. A. González, executive vice-president; F. Carrizosa, financial vice-president; S. Pretelt, administrative vice-president; H. Wild, vice-president traffic and sales.
Fleet: four L-1049G, one L-749A, 13 DC-4, 23 Hi-per DC-3, 11 C-47.
Results for year ended December 31, 1955: 903,645 passengers; 67,845 tons of freight and 659 tons of mail carried; 71,239,000 ton-km flown; total costs, £12,170,885; total revenue, £12, 881,191; 5,011 staff.

Aerovias Panama Airways was founded in 1951 as Aerovias Interamericanas de Panama, S.A. (Avispa), and began operations mainly as a cargo carrier using C-46s leased from the Colombian company Lineas Interamericanas. In 1952 the company was designated by the Panama Government to operate a Panama-

Miami route. In 1954 the airline concluded an agreement with Trans-Caribbean Airways whereby a DC-6 and flight crews would be supplied for the Miami service. Services are now operated between Panama and Miami and between Panama and Lima via Guayaquil.
Head Office: New York, U.S.A.
Executives: H. Barletta, president; V. Inchausti, secretary/treasurer/operations manager.
Fleet: DC-4.
Traffic statistics not available.

Aerovias "Q," S.A.—"Q" Airways, was founded in October 1945 and began operations in 1946 to Key West and Gerona. Present operations are from Havana to West Palm Beach, Florida, twice a week; to Gerona, Isle of Pines, twice daily; and to Key West, Florida, thrice daily.
Head Office: Havana, Cuba.
Executives: M. Cuevedo, president/general manager; M. Rodriquez, traffic manager; J. E. A. de Rogato, operations manager.
Fleet: C-46.
Traffic statistics not available.

Aerovias Sud Americana, Inc., was founded in 1949 as a contract cargo carrier operating a route from Tampa, Florida, to Havana. Scheduled services were begun in December 1952 with routes extending as far south as Bogotá in Columbia. Countries now served are Cuba, British Honduras, Guatemala, Salvador, Nicaragua, Costa Rica, Panama, Colombia and Ecuador.
Head Office: St. Petersburg, Florida, U.S.A.
Executives: V. V. Carmichael Jnr., president and general manager; D. M. Benson, vice-president/director flying; R. C. Minor, vice-president maintenance; P. E. Dixon Jnr., vice-president sales; J. D. Rains, secretary/treasurer.
Fleet: six Curtiss C-46.
Results for year ended December 31, 1955: 5,880,055 freight ton-miles flown; total costs, £691,528; total revenue, £696,494; 129 staff.

Aerovias Venezolanas, S.A.—AVENSA., operates domestic passenger and freight services with DC-3s and Convairs; two Convair services a week between Venezuela and Miami *via* Jamaica; and a weekly C-46 operated cargo service from Caracas to Miami, returning *via* Kingston. The company was formed in 1943 by Venezuelan interests and Pan American Airways. Regular services were begun in 1944. LAV is believed to have a financial interest in AVENSA.
Head Office: Caracas, Venezuela.
Executives: H. L. Boulton, president; A. Boulton, acting president/general manager; G. O. Tucker, vice-president operations; R. van den Branden, vice-president traffic and sales; A. J. Lanz, chief of maintenance; J. Sáiz, chief accountant.
Fleet: five Convair 340, 17 DC-3, three C-46.
Results for year ended December 31, 1956: 294,623 passengers; 11,285,000 kg of freight carried; 946 staff. Other details not available.

Air Algérie—see Compagnie Générale de Transports Aériens Air Algérie.

Air Atlas-Air Maroc. Compagnie Chérifienne de Transports Aériens, operates services in North Africa and between North Africa and France, Spain and Switzerland. The airline was founded in July 1953 by the amalgamation of the Casablanca-based Air Atlas and Air Maroc companies. Air Atlas was formed in 1946 and began operations with Junkers 52/3ms and Air Maroc was founded in 1947 and began scheduled services in 1949.
Head Office: Casablanca, Morocco.
Executives: M. Laraki, president; A. Faurous, director general; P. Valent, administrative director; F. Legras, commercial director; M. Delluc, technical director.
Fleet: four DC-4, four DC-3.
Results for year ended December 31, 1956: 137,344 passengers; 3,028,765 kg of freight and 521,768 kg of mail carried; 12,978,362 ton-km flown; 384 staff. Financial details not available.

Air Ceylon, Ltd., founded by the Ceylon Government in 1947, in that year opened services between Ceylon and India. In 1949 a route to London was opened. In 1951 Air Ceylon was made an independent company with the Government holding 51 per cent of the stock and Australian National Airways holding 49 per cent. A route to Australia was opened, thus providing a through Australia-Ceylon-London service; this route was abandoned in 1953 but in co-operation with K.L.M. the route to Europe (serving London and Amsterdam) was reopened in 1956 using a K.L.M. Constellation painted in Air Ceylon colours but with Dutch registration.
Head Office: Colombo, Ceylon.
Executives: J. L. M. Fernando, managing director; K. de Croos, manager/secretary; F. B. W. Goonewardena, accountant; W. A. E. Molamure, chief engineer; P. B. Mawalagedera, chief pilot.
Fleet: two DC-3.
Results for year ended December 31, 1955: 28,595 passengers; 264.5 tons of freight and 11.6 tons of mail carried; 880,490 ton-km flown; total revenue, £1,075,940; 200 staff. Costs not available.

Air Chile/Lyon Air—Sociedad de Transportes Aereos, Ltda., is a new company which has recently begun operation of scheduled services between Santiago and Arica and between Santiago and Panama City via Lima and Guayaquil.
Head Office: Santiago, Chile.
Fleet: C-46.

Air France—see Compagnie Nationale AIR FRANCE.

Air-India International was formed as a limited company in June 1948 with Air-India Ltd. holding 51 per cent of the shares and the Government of India 49 per cent. On August 1, 1953, A.I.I. became a State-owned corporation with the continuing responsibility of operating Indian long-distance international air services.

The company began operation of a weekly Bombay-Cairo-Geneva-London service in June 1948. A.I.I. now operates daily services between India and England. Rome, Paris, Zürich, Düsseldorf, Prague, Beirut and Damascus have been added as calls on this route while Delhi and Calcutta have been added as Indian terminals. The airline also operates services to Bangkok, Hong Kong, Tokyo, Madras, Singapore, Sydney, Karachi, Aden and Nairobi.
Head Office: Bombay, India.
Executives: J. R. D. Tata, chairman; B. R. Patel, general manager; S. K. Kooka, traffic manager; A. C. Gazdar, technical director; N. J. Pavri, controller of accounts.
Fleet: three L-749 Constellation, eight L-1049, one DC-3. On order: three Boeing 707-420 (1960).
Results for year ended March 31, 1956: 62,079 passengers; 1,257,343 kg of freight and 422,189 kg of mail carried; revenue ton-miles flown, 21,452,852; total costs, £5,249,230; total revenue, £5,278,307; 3,395 staff.

Air Jordan Co., Ltd., was founded in 1950 by local interests and services were begun with Airspeed Consuls. In 1953 Transocean Air Lines acquired an interest in Air Jordan and DC-3s were introduced. The airline now operates from Jerusalem and/or Amman to Cairo, Damascus, Beirut, Kuwait, Benghazi, and Tripoli (Libya).
Head Office: Amman, Jordan.
Executives: A. Z. Nuseibeh, chairman; A. M. el-Qutob, general manager; S. R. Kochenderfer, executive director.
Fleet: DC-3, Curtis C-46.

Air Laos was formed in 1952 by Air France, Aigle Azur and local interests. Air France sub-

Air - India International's Lockheed Super Constellations are now operating daily services between England and India and also flying between Bombay and Sydney, Australia.

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scribed 30 per cent of the original stock and Aigle Azur 20 per cent. Services are operated from Vientiane to a number of places in Laos and to Saigon, Bangkok and Hong Kong.
Head Office: Vientiane, Indo-China.
Executives: not available.
Fleet: DC-3, Bristol 170, Stratoliner.
In its first year the airline carried more than 16,000 passengers.

Air Liban was founded in 1945 as Compagnie Générale de Transport and took its present title in 1951. Air Liban is an associate of Air France and operates services between Beirut and Accra, Aleppo, Cairo, Dhahran, Doha, Fort Lamy, Jerusalem, Jeddah, Khartoum, Kuwait, Lagos and Nicosia.
Head Office: Beirut, Lebanon.
Executive: B. Méguerdiche, director general.
Fleet: four DC-3, two DC-4, one Languedoc, two York.
Results for year ended December 31, 1955: 47,915 passengers; 1,234 tons of freight and 28.9 tons of mail carried; 4,359,000 ton-km flown; 240 staff. Financial details not available.

Air Madagascar was founded in 1947 and operates a network of services within Madagascar.
Head Office: Tananarive, Madagascar.
Executives: M. Vernier, director general; M. Callu, asst. director; M. Meyer, chief pilot; M. Lossignol, chief of technical services.
Fleet: two DC-3, six D.H.89, three Cessna, one Gemini. On order: one DC-3.
Results for year ended December 31, 1955: 8,146 passengers; 212,600 kg of freight and 72,511 kg of mail carried; 211,966 ton-km flown; 95 staff. Financial details not available.

Airtaxco A.B. was founded in 1934 as A. B. Bjorkvallsflyg and in 1944 became Skandinaviska Aero A.B. (Scandinavian Airways, Ltd.). Later S.A.S. paid the company about £10,000 to change its name. The present title was taken in 1951. Newspaper services are flown from Stockholm to Sundsvall/Härnösand, Karlstad, Trollhättan, Gothenburg, Alvesta, Malmö and other Swedish destinations and the company is allowed to carry passengers to Stockholm on the return flights from some of the points served. Charter and ambulance work is also undertaken.
Head Office: Stockholm, Sweden.
Executives: C.-H. Höljfors, managing director; T. Andersson, flight superintendent; A. Ericsson, traffic and sales manager.
Fleet: Four DC-3, four Lodestar, one Lockheed 10.
Results for year ended December 31, 1956: 32,800 passengers; 4,027,440 kg of freight carried; total ton-km flown 1,540,213; 105 staff. Financial details not available.

Air Vietnam was founded in 1951 to take over domestic and regional services previously operated by Air France. The Vietnamese Government holds 50 per cent of the stock and Air France holds 33 per cent. Air Vietnam flies domestic services and to Laos, Hong Kong and Bangkok.
Head Office: Saigon, Indo-China.
Executives: N. Van Tri, president; L. C. Trinh, manager.
Fleet: three DC-3, six Bristol 170, Boeing Stratoliner.
Results for year ended December 31 1955: 126,925 passengers; 1,891,000 freight ton-km and 205,000 mail ton-km flown; total ton-km 7,685,000; 766 staff. Financial details not available.

Alaska Airlines, Inc., adopted its present title in 1944, having been founded in 1937 as Star Air Lines Inc., to take over Star Air Service, which had been doing charter work for several years; the latter had acquired McGee Airways, which was founded in 1932. In 1942 and 1943 Star Air Lines took over Pollack Air Lines, Lavery Airways and Mirow Air Service. Alaska Airlines, which has an extensive Alaskan route system and also serves Seattle and Portland, still uses the title "Route of the Starliners."
Head Office: Seattle, Washington, U.S.A.
Executives: Nelson David, president; Homer W. Robinson, chairman; R. J. Norris, treasurer.
Fleet: two DC-4, three DC-3, three C-46, 12 single-engined aircraft. On order, two DC-6B (Oct. 1957).
Results for year ended December 31, 1956: 44,180 passengers; 5,422,175 freight and 551,638 mail ton-miles flown; total ton-miles 9,422,815; total costs £2,091,081; total revenue, £2,171,412; 450 staff.

Alaska Coastal Airlines operate a network of domestic services based on Juneau. The airline was formed in 1939 as a partnership by Alaska Air Transport, founded in 1935, and Marine Airways, founded in the following year.
Head Office: Juneau, Alaska.
Executives: S. B. Simmons and O. F. Benecke, co-managers; F. L. Guertin, traffic manager; H. S. Gruening, operations manager.
Fleet: nine Goose, one Canso, one Bellanca Pacemaker, one Lockheed Vega, one Cessna 195, four Piper Pacer, one Hiller 12C.
Results for year ended December 31, 1956: 47,258 passengers; 60,455 kg of freight carried; 48.166 mail ton-miles flown; total revenue ton-miles 542,413; total costs, £434,843; total revenue, £456,969; 105 staff.

Alitalia — Aerolinee Italiane Internazionali was formed in 1946 as a joint British-Italian venture with B.E.A. holding 30 per cent of the original capital. Additional capital was called up in 1955 and B.E.A. sold one-third of its investment to B.O.A.C. Operating in pool with B.E.A. on certain European routes, Alitalia operates a European network and routes to Johannesburg, Brazil, Argentina, Venezuela, Uruguay, Lebanon and Iraq. There are also some domestic services linking Rome, Milan, Turin and Catania. A London-Venice service is to be introduced this summer. Alitalia made a profit of £133,000 in its financial year 1954-1955.
Head Office: Rome, Italy.
Executives: Count Dr. N. Carandini, chairman; Lord Douglas of Kirtleside, vice-chairman; Ing B. Velani, director general; Dr. D. Saracino, administration manager; R. Cappelletti, commercial director.
Fleet: six DC-6B, four Convair 340, two Convair 440. On order: four DC-7C (1957/58). Turbojet aircraft will be ordered soon.
Results for year ended December 31, 1956: 217,077,269 passenger-km flown; 2,455,073 freight and 1,278,547 mail ton-km flown; 46,148,859 ton-km offered. Other details not available.

Allegheny Airlines, Inc., was founded in 1937 as All-American Airways. That company pioneered "pick up" air mail services using Stinson Reliants with collection attachments. These services were worked under contract with the post office and from 1940 under C.A.B. certification. By 1946 nearly 6,000 miles a day were being flown at 94 per cent regularity. The system extended from Philadelphia in the east to Cincinnati in the west and Charleston in the south to Jameston, N.Y., in the north. There were four flights a day. The service was withdrawn in 1949 after nearly 15 million miles had been flown. All-American began normal scheduled passenger services in 1949, and became Allegheny Airlines in 1953. Permanently certificated routes now extend from Detroit and Buffalo through Pennsylvania, New York, New Jersey, Maryland, Ohio, Delaware and West Virginia.
Head Office: Washington, D.C., U.S.A.
Executives: L. O. Barnes, president; R. M. Love, chairman; E. K. Arnold, vice-president/secretary; D. L. Miller, vice-president traffic and sales; W. J. Short, vice-president/treasurer.
Fleet: 15 DC-3, six Martin 2-0-2.
Results for year ended December 31, 1956: 393,668 passengers; 52,834 kg of freight and 64,011 kg of mail carried; 6,569,553 ton-miles flown; total costs £2,461,678; total revenue £2,390,425; 686 staff.

Aloha Airline—see Trans-Pacific Airlines, Ltd.

American Airlines, Inc., which carries more passengers annually than any other airline, was founded in 1934 as successor to American Airways which had come into existence in 1930 to integrate the operations of more than a dozen operators. The present-day organization is a vast undertaking and in 1955 its fleet of 196

One of Air Jordan's gaily painted Douglas DC-3s seen on arrival at Beirut International Airport. The airline has recently extended its operations west to Benghazi and to Tripoli.

aircraft carried nearly eight million passengers and flew nearly 93 million freight and mail ton-miles. The airline has nearly 90 aircraft on order at the present time. Its route system stretches from coast to coast, into Canada and south to Mexico, while throughplane agreements stretch the network southeast from Dallas to Miami. American operates 10 daily non-stop and 16 one-stop coast to coast flights in each direction, and 13 one-stop DC-6 coach flights. More than 450 flights a day are operated to 77 major cities and more than 22,000 passengers are carried daily.

Head Office: New York, U.S.A.
Executives: C. R. Smith, president; W. J. Hogan, snr. vice-president finance; C. W. Jacob, snr. vice-president/secretary; O. M. Mosier, snr. vice-president operations; C. R. Speers, snr. vice-president sales.
Fleet: 39 DC-7, 25 DC-6B, 50 DC-6, 73 Convair 240, seven DC-6A, two DC-4. On order: three DC-6A (1957), 19 DC-7 (1957), 35 Electra (1959), 30 Boeing 707 (1959).
Results for year ended December 31, 1956: 7,800,000 passengers; 75,000,000 freight and 17,800,000 mail ton-miles flown; total costs (preliminary), £97,653,135; total revenue (preliminary), £104,903,090; 20,000 staff.

Ansett Airways Pty., Ltd., was founded by R. M. Ansett in 1936 and the airline's first service was opened that year between Melbourne and Hamilton, the route over which Ansett had previously operated road services. The company's route mileage is now about 7,000. The original route is still covered and services are operated with land aircraft from Melbourne to Tasmania, Adelaide, Sydney, Brisbane and other points as far north as Cairns. In 1952 Ansett took over the flying-boat operator Barrier Reef Airways and in 1953 acquired some of the routes of another flying-boat operator Trans Oceanic Airways. Ansett now operates Sandringhams between Sydney and Hobart; from Sydney to Lord Howe Island; and (in summer) from both Sydney and Brisbane to Hayman Island.

Head Office: Melbourne, Victoria, Australia.
Executives: R. M. Ansett, chairman; R. D. Collins, general manager; J. R. Fowler, operations superintendent.
Fleet: six DC-3, two Convair 340, two Sandringham.
Results for quarter ended September 30, 1955: 51,585 passengers; 2,108,272 kg of freight and 6,804 kg of mail carried; 929,146 freight and mail ton-miles flown. Other details not available.

Arab Airways (Jerusalem), Ltd., successor to Arab Airways Association, was founded in 1953, and B.O.A.C. has a minority interest. Services are operated within Jordan and to Iraq, the Lebanon, Egypt, Saudi Arabia, Kuwait and Aden.

Head Office: Amman, Jordan.
Executives: M. A. Bdeir, chairman; Sir Duncan Cumming, S. As'ad, M. Madi, Capt. J. Alger, A. Alauddin, board members; W. Salameh, manager; H. H. Pusey, resident adviser.
Fleet: three DC-3.
Results for year ended December 31, 1956: 22,464 passengers; 244,308 kg of freight and 33,486 kg of mail carried; 897,471 ton-miles flown; 96 staff; financial details not available.

Arkia, Israel Inland Airlines, Ltd. Founded in 1950 by El Al and Kanfot, a company owned by the General Federation of Labour. At present the only scheduled operations are from Haifa to Tel Aviv/Yafo and from Haifa and Tel Aviv to Elath at the head of the Gulf of Aqaba.

Head Office: Tel Aviv, Israel.
Executives: J. Hozman, managing director; K. Eisinger, technical manager.
Fleet: two DC-3. On order: two DC-3 (June 1957)
Results for year ended December 31, 1956: 23,330 passengers, 352,638 kg of freight and 5,687 kg of mail carried; 165,869 ton-km flown; 24 staff. Financial details not available.

Aryana Airlines Co., Ltd., was founded in 1955 with the assistance of Indamer Co., Ltd., which holds 49 per cent of the stock. The Afghanistan Government has a 51 per cent interest. Previously Indamer had held an Afghanistan Government contract for the carriage of pilgrims to Jeddah. The Indian company will be responsible for technical and operational matters and for training Afghan staff. Services are operated within Afghanistan and to Bahrain, Iran, Beirut, and India.

Head Office: Kabul, Afghanistan.
Executives: F. Mahomed, president; P. Baldwin (managing director of Indamer), vice-president.
Fleet: three DC-3.
No traffic statistics yet available.

ATSA—see Aero Transportes, S.A.

Australian National Airways Pty., Ltd., is the largest privately owned Australian airline. It was incorporated in 1936 but can trace its origin to 1932, when Holyman Brothers Pty. opened services in Tasmania with a Fox Moth. A.N.A. and its predecessor were the first to operate DC-2s in Australia. The company took an interest in Cathay Pacific Airways in 1948 and also entered into partnership with Air Ceylon as a result of which A.N.A. was flying DC-4s between Australia and the United Kingdom *via* Ceylon. The airline now operates an extensive network in Australia serving all the main cities, many more isolated areas, and also Tasmania. On many routes A.N.A. is in competition with T.A.A. In 1948 A.N.A. was concerned with others in the formation of Air Beef Pty., Ltd., which has been carrying heavy loads of carcases from the Kimberley district to Wyndham on the northwest coast.

Head Office: Melbourne, Victoria, Australia.
Executives: P. W. Haddy, chairman; F. Kay, chief executive; G. H. Archibald, operations manager; J. O. Declerck, secretary/finance manager; I. G. Webster, traffic and sales manager.
Fleet: four DC-6B, two DC-6, eight DC-4, 14 DC-3, three Bristol 170, one Bristol 171.
Results for year ended December 31, 1956: 626,359 passengers; 40,192,000 kg of freight and 970,000 kg of mail carried; 51,327,705 ton-miles flown; 3,561 staff.
Financial details not available.

Austrian Airlines — see Osterreichische Luftverkehrs A.G.

Avalon Air Transport, Inc., operates flying-boat amphibian services between Long Beach Municipal Airport and Avalon on Catalina Island. In winter there are two flights a day and in season the route is served every half hour.

Head Office: Long Beach, California, U.S.A.
Executives: Wilton R. Probert, president; W. B. von Kleinsmid, secretary/treasurer.
Fleet: six Grumman Goose.
Results for year ended December 31, 1956: 59,272 passengers; 175,000 kg of mail carried; 24 staff. Other details not available.

AVENSA—see Aerovias Venezolanas, S.A.

Aviacion Y Comercio, S.A. (AVIACO), was founded as a private nonscheduled operator in 1940, scheduled operations began in 1950. Routes radiate from Madrid to points on the Spanish mainland and from Madrid and Barcelona to Majorca. In North Africa, Tetuan, Casablanca, Oran and Algiers are served; there are also services from Spain and Casablanca to Las Palmas and Tenerife. A.Y.C. also operates a Marseilles - Majorca service. The company has also operated services from Spain to Brussels and Amsterdam and to West Africa and Spanish Guinea, but these have been discontinued.

Head Office: Madrid, Spain.
Executives: J. P. Montes, managing director; E. O'Connor, operations manager; F. MacLennan, commercial manager; J. Nedal, chief engineer; J. Inchausti, traffic director.
Fleet: six Bristol 170, eight Languedoc. On order: eight Heron 2 (1957).
Results for year ended December 31, 1956: 222,284 passengers; 298,624 freight ton-km and 459,848 mail ton-km flown; total revenue ton-km flown 8,527,038. Financial details and number of staff not available.

This Allegheny Airlines' Martin 2-0-2, seen at Washington National Airport, is one of the company's fleet operated under the title "The Pennsylvanian."

AVIANCA—see Aérovias Nacioñales de Colombia.

AVIATECA—see Empresa Guatemalteca de Aviación.

Bahamas Airways, Ltd., was founded in 1936 to take over the operation of inter-island charter services begun in 1933. In 1943, Pan American Airways acquired a 45 per cent interest in the company but in 1949 Bahamas Airways was taken over by B.S.A.A. and the airline is now a wholly owned B.O.A.C. subsidiary. In March 1956, Bahamas Airways inaugurated a service to Grand Turk, Turks Island *via* San Salvador, Mayaguana and Great Inagua. The airline operates frequent services under a B.O.A.C. permit between Miami, Cat Cay, Bimini, West End, and Grand Bahama.

Head Office: Nassau, Bahamas, B.W.I.
Executives: H. G. Christie, chairman; B. G. W. Wiggett, deputy chairman; Capt. Peter Fair, general manager; K. Ashworth, secretary/accountant.
Fleet: three Heron, two Goose, one Canso.
Results for year ended December 31, 1956: 26,914 passengers and 51,500 kg of freight carried; 55 staff. In the financial year 1955/56 the airline incurred a loss of £46,127.

Bonanza Airlines, Inc., was founded in 1945 and began service between Las Vegas and Reno in 1946. With 10 years of experience the company is now operating about 1,200 miles of routes in Nevada, Arizona and southern California.

Head Office: Las Vegas, Nevada, U.S.A.
Executives: E. Converse, president; Florence Murphy, vice-president/secretary; R. H. Herrnstein, treasurer; G. R. Henry, executive vice-president/general counsel; M. W. Reynolds, vice-president operations; Wm. J. Mitchell, vice president traffic and sales.
Fleet: nine DC-3. On order: three Friendship (1958).
Results for year ended December 31, 1956: 127,860 passengers; 106,909 freight and 49,162 mail ton-miles flown; 2,796,363 total revenue ton-miles flown; total costs £1,055,967, total revenue, £1,098,735; 312 staff.

Braathens South-American and Far East Airtransport A/S. (S.A.F.E.) was formed in 1946 by the Norwegian Braathen shipping concern for the operation of long-distance charter services. Following non-scheduled flights to the Far East the company operated regular scheduled services between Norway and Hong Kong from 1949 until early in 1954, when the licence was not renewed by the Norwegian Government. The company now operates scheduled internal services with Herons from Oslo to Trondheim and in the area between Oslo and Kristiansand and Stavanger. S.A.F.E. also collaborates with Loftleidir in the operation of its Europe - Iceland - North America services.

Head Office: Oslo, Norway.
Executives: L. G. Braathen, president; B. G.

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Braathen, vice-president; E. Fröysaa, commercial manager; J. Raad, operations manager.
Fleet: two DC-4, one DC-3, three Heron; on order: three Fokker Friendship (1958/59), one Electra (1959) and option on two Friendship.
Results for year ended December 31, 1956: 50,225 passengers; 183,000 kg of freight and 97,100 kg of mail carried; 1,320,342 ton-km flown; 360 staff. Financial details not available.

Braniff International Airways Inc. The original Braniff company was founded in 1928 by Paul and Tom Braniff; and the line's first aeroplane, a Stinson Detroiter, bore the title Tulsa-Oklahoma City Airline on its fuselage. In 1929 the airline became part of the Universal Aviation Corporation and in 1930 Braniff Airways was organized as an independent company. The word International was added to the title in 1948, when services were begun to Havana and Lima. The airline now operates more than 15,000 miles of routes in the United States and to South America. The South American routes are *via* the west coast to Lima, from where they branch to Sao Paulo and Rio de Janeiro, La Paz, Asuncion and Buenos Aires. In 1952 Mid-Continent Airlines was merged with Braniff.
Head Office: Dallas, Texas, U.S.A.
Executives: C. E. Beard, president; J. W. Miller, executive vice-president; R. V. Carleton, vice-president operations; O. W. Crane, treasurer.
Fleet: nine DC-6, 26 Convair 340; 24 DC-3, seven DC-7C, Convair 440. On order: nine Lockheed Electra, five Boeing 707.
Results for year ended December 31, 1956: 1,820,673 passengers; 86,439,335 revenue ton-miles flown. Other details not available.

British European Airways Corporation—see page 588.

British Guiana Airways, Ltd. In 1934 A. J. Williams, a U.S. citizen, began charter operations in British Guiana with a single-engined Ireland flying-boat. British Guiana Airways was founded by Mr. Williams to operate regular subsidized services in 1939. The company now flies numerous domestic services and also operates flying-boat services from British Guiana to Trinidad, Grenada, St. Lucia, Barbados, St. Vincent, Martinique and Dominica.
Head Office: Georgetown, British Guiana.
Executives: Lt-Col. A. J. Williams, O.B.E., managing director; H. E. Wendt, general manager.
Fleet: three DC-3, two Goose.
In 1953 the company carried more than 3,500 passengers.

British Honduras Airways, Ltd., bought the assets of the Airline Division of British Colonial Airlines on October 24th, 1956, and is operating the services worked by the earlier company which was incorporated in March 1952. Scheduled services are operated between Corozal and Punta Gorda *via* Belize and Stann Creek. There are eight intermediate flag stops. Non-scheduled operations serve a score of other places in the territory.
Head Office: Belize, British Honduras.
Executive: Col. T. S. Baker, manager.
Fleet: Cessna 170.
Traffic statistics not available.

British Overseas Airways Corporation—see page 587.

British West Indian Airways, Ltd., is a wholly owned subsidiary of B.O.A.C. The original concern was organized in 1940 and began operations with one Lodestar. In 1947 British South American Airways acquired control of B.W.I.A. and this passed to B.O.A.C. when it took over B.S.A.A. In 1949 B.O.A.C. took over British Caribbean Airways and merged its operations with those of B.W.I.A. A considerable network of Caribbean services is operated and Viscounts have now been introduced on the following routes:—Trinidad-Barbados - San Juan - Bermuda - New York; Bermuda - New York; Nassau - Miami; Kingston - Montego Bay - Grand Cayman - Miami; Kingston - Caracas - Trinidad; and Trinidad - Barbados-San Juan.
Head Office: Port of Spain, Trinidad.
Executives: Sir Errol Dos Santos, O.B.E., chairman; J. H. Rahr, general manager; L. G. S. Hyland, assistant gen. man.; Capt. P. Kelshall, technical manager.
Fleet: five Viking, three DC-3, four Viscount. On order: four Viscount (1957).
Results for year ended December 31, 1956: 88,833 passengers; 534,109 kg of freight and 152,270 kg of mail carried; 6,239,861 ton-miles flown; 1,066 staff.

Australian National Airways' Douglas DC-6B "Bungana" works with others of its type on A.N.A.'s extensive network of trunk services based on Melbourne.

Butler Air Transport, Ltd., was founded in 1934 to operate a Charleville-Cootamundra service connecting with the Imperial Airways-Qantas England-Australia route. The airline was registered as a public company in 1952 and a large proportion of the stock is owned by company staff. In 1947 acquired the controlling interest in Queensland Airlines. Butler Air Transport operates about 9,000 miles of routes from Sydney to towns in New South Wales, with some short penetrations into Queensland. BAT has been getting very high utilization with its Viscounts into which it has built its own air-stairs.
Head Office: Sydney, N.S.W., Australia.
Executives: C. A. Butler, chairman/managing director; T. Williams, general manager; T. R. Young, operations manager.
Fleet: two Viscount, five DC-3.
Results for year ended December 31, 1955: 158,442 passengers; 2,684 tons of freight and 10 tons of mail carried; total costs, £732,672; total revenue, £769,880; 308 staff. Financial details for year ended June 30.

BWIA—see British West Indian Airways.

Byerly Airlines operates a daily service from Jacksonville, Illinois, to Peoria where it connects with T.W.A. flights to and from Chicago.
Head Office: Peoria, Ill., U.S.A.
Fleet: Lockheed Electra, Beech Bonanza.

California Central Airlines was founded in 1947 as an intrastate carrier, began scheduled services in 1949 and now thought to operate services linking San Diego, the Los Angeles airports, San Francisco and Oakland. At one period the company was operating some Martin 2-0-2s but following financial difficulties and disputes with the C.A.B., these aircraft were disposed of.
Head Office: Burbank, Cal., U.S.A.
Executives: Col. C. C. Sherman, president/director of operations; E. K. Sherman, secretary/treasurer.
Fleet: reported as one DC-3.
Traffic statistics not available.

Canadian Pacific Air Lines, Ltd., was founded in 1942 by the Canadian Pacific Railway to acquire ten of the "bush" airlines, best known of which was Canadian Airways. C.P.A. operated a network of services in west and northwest Canada; a smaller network in the Winnipeg area; and a third system in Quebec and Labrador. These were part of the overall C.P.R. system including railways and ships. In 1949 the company opened two trans-Pacific routes, the first *via* Honolulu, Canton and Fiji to Sydney, and the second *via* Anchorage, Shemya and Tokyo to Hong Kong. In 1955 a trans-Polar route was opened between Vancouver and Amsterdam. The eastern Canada services have now been taken over by T.C.A. The airlines' main trunk routes now extend from Sydney and Auckland to Amsterdam *via* Fiji, Honolulu and Vancouver and from Buenos Aires to Hong Kong *via* Lima, Mexico City, Vancouver and Tokyo. There are also services between Toronto and Mexico.
Head Office: Vancouver, B.C., Canada.
Executives: G. W. G. McConachie, president; R. W. Ryan, executive vice-president; H. B. Renwick, vice-pres. traffic; R. B. Phillips, vice-pres. operations.
Fleet: seven DC-6B, one DC-4, five Convair 240, eight Curtiss C-46F, 13 DC-3, two Canso, two Otter. On order: eight DC-6B (1957/58), six Britannia 314 (1957/58), option on further five Britannia (1959/60).
Results for year ended December 31, 1956: 251,542 passengers; 5,029,000 kg of freight and 1,425,000 kg of mail carried; 30,976,288 ton-miles flown; total costs, £9,704,340; total revenue, £9,931,461; 2,245 staff.

Capital Airlines, Inc., can trace its history back to April 1927 when Skyline Transportation Company began flying mail between Pittsburgh and Cleveland. The following year Skyline was taken over by Pennsylvania Airlines and passenger services were begun. In 1936 Pennsylvania Airlines and Central Airlines (then flying Detroit-Washington mail services) merged to form Pennsylvania-Central Airlines. The present name was adopted in 1948. Capital was a pioneer of air coach services and also the first U.S. airline to introduce turbine-powered aircraft, having placed orders for a total of 75 Viscounts. Capital has a large route network in the eastern, north eastern and southern states.
Head Office: Washington, D.C., U.S.A.
Executives: J. H. Carmichael, president; R. G. Lochiel, vice-pres./ treas.; J. B. Franklin, vice-president operations; J. W. Austin, vice-president traffic and sales.
Fleet: 60 Viscount, 12 Lockheed L-049, 20 DC-4, 20 DC-3. On order: 15 Viscount, four Comet 4, 10 Comet 4A.
Results for year ended December 31, 1956: 2,984,410 passengers; 86,927,252 revenue ton-miles flown. Other details not available.

Caribbean Atlantic Airlines, Inc.—Caribair was founded in 1939, and in June that year took over the operations of its predecessor, Powelson Air Service, which had started scheduled services late in 1938. The company now operates services within Puerto Rico and to the Dominican Republic and the Virgin Islands.
Head Office: San Juan, Puerto Rico.
Executives: D. Trigo, president; J. Sierra, vice-president operations; R. B. Forrest, vice-president traffic.
Fleet: three DC-3.

Results for year ending December 31, 1954: 120,000 passengers; 36,000 freight and mail ton-miles flown; total ton-miles, 944,000. No later figures available.

Caspar Air Charters and Agencies, Ltd., is a charter operator but for several years has been operating scheduled services around Lake Victoria in association with East African Airways. Services are now operated from Entebbe to Bukoba, Geita and Mwanza.
Head Office: Nairobi, Kenya.
Executives: E. B. Fielden, managing director; J. E. F. Wilkins, F. P. Nelson Gracie, D. Lead, directors.
Fleet: D.H.89 on scheduled services.
Traffic statistics not available.

C.A.T.—see Civil Air Transport.

Catalina Airlines. Little is known about this airline except that it operates hourly services from Los Angeles International Airport to Catalina Island. In 1931 Catalina Island began to receive air transport when Wilmington Catalina Airline opened a service from Wilmington, Cal. Two Douglas Dolphin amphibians were used and 7,878 passengers were carried in the first year.
Head Office: Beverley Hills, Cal., U.S.A.
Fleet: two Dove.

Cathay Pacific Airways, Ltd., founded in 1946 and reorganized in 1948, when 80 per cent of the stock was acquired by Butterfield and Swire and associated shipping companies, and Australian National Airways. Further reorganization gave the Butterfield and Swire group 52 per cent, Peninsular and Oriental Steam Navigation Co. 30 per cent, Australian National Airways 14 per cent and The Borneo Co., Ltd., 4 per cent. The Hong Kong government, in 1949, gave Cathay Pacific Airways rights for the operation of routes south of Hong Kong. Routes are operated to Bangkok, Calcutta, Labuan, Manila, Rangoon, Saigon and Singapore.
Head Office: Hong Kong.
Executives: J. A. Blackwood, chairman; W. C. G. Knowles, managing director; D. R. Y. Bluck, traffic manager; C. F. Moore, operations manager; K. W. Steele, flight superintendent; J. T. Gething, chief engineer.
Fleet: one DC-6, one DC-4, one DC-3. On order: one DC-6B (1958).
Results for year ended December 31, 1956: 43,322 passengers; 546,011 kg of freight and 112,972 kg of mail carried; 8,018,716 ton-km flown; 161 staff. Financial details not available.

Causa—see Compania Aeronautica Uruguaya, S.A.

Central African Airways Corporation, formed in 1946 by the Governments of Northern and Southern Rhodesia and Nyasaland, C.A.A. is successor to the war-time Southern Rhodesia Air Services and the pre-war Rhodesia and Nyasaland Airways. Operating some 15,000 miles of routes, the corporation is now the airline of the Federation of Rhodesia and Nyasaland. In addition to domestic services and the Rhodesian Viscount and *Zambezi* coach service to London C.A.A. operate services to the Union of South Africa, Kenya, Tanganyika, the Belgian Congo and Portuguese East Africa.
Head Office: Salisbury, Southern Rhodesia.
Executives: P. J. B. Wimbush, general manager; K. H. Greager, engineering manager; R. A. Bourlay, operations manager; R. P. Hartley, secretary/chief accountant; H. D. Gray, traffic manager; W. L. Stedman, sales manager.
Fleet: five Viscount 700D, five Viking, five DC-3, five Beaver.
Results for year ended December 31, 1956: 169,446 passengers; 1,249,444 kg of freight and 574,121 kg of mail carried; 14,624,918 ton-km flown; total costs (year ended March 31st, 1956), £2,320,804; total revenue (same period), £2,344,414; 1,406 staff.

Central Airlines, Inc., was founded as an intrastate operator in Oklahoma in 1944. The company's first inter-state operations were authorized in 1946 and operations, with Beech Bonanzas, were inaugurated in September 1949. DC-3 operations began in 1950 and all Bonanzas were withdrawn during the following year. At present the airline has a route mileage of 3,299 serving 33 cities in Texas, Oklahoma, Arkansas, Kansas, Missouri and Colorado.
Head Office: Fort Worth, Texas, U.S.A.
Executives: K. H. Kahle, president; F. E. Howe, executive vice-president/treasurer; A. S. Aldridge, vice-president traffic and sales; Edgar Keltner Jnr., secretary.
Fleet: 11 DC-3.
Results for year ended December 31, 1956: 107,119 passengers; 325,140 kg of freight and 248,930 kg of mail; 6,629,217 ton-miles flown; total costs, £1,207,356; total revenue, £1,207,889; 406 staff.

Central Northern Airways—see Trans-Air, Ltd.

Ceskoslovenské Aerolinie-CSA is the Czech State airline which was founded in 1946 as successor to the C.S.A. established in 1923 and which, until the war, operated in competition with C.L.S. The airline now operates domestic services and to Belgrade, Berlin, Bucharest, Budapest, Copenhagen, Helsinki, Moscow, Paris, Prague, Sofia, Stockholm, Vienna, Zürich, Brussels, Vilno and Warsaw.
Head Office: Prague, Czechoslovakia.
Executives: Josef Procházka, general manager; Al. Palichleb, deputy general manager.
Fleet: 21 DC-3, seven Li-2, eight Il-12. On order: 10 Il-14 (1957), three Tu-104 (1957).
Results for year ended December 31, 1956: 217,520 passengers; 2,075,737 kg of freight and 3,439,248 kg of mail carried; revenue ton-km flown 11,552,412; total costs £4,643,250; total revenue, £3,292,550; 1,210 staff.

Chicago Airways Inc., operates daily services, under VFR conditions only, from Chicago Midway Airport *via* O'Hare Airport to Northbrook, Libertyville, Waukegan, Kenosha, Racine and Milwaukee. The company carries passengers and air express.
Head Office: Chicago, Illinois, U.S.A.
No other details are known.

Chicago Helicopter Airways, Inc., has authorization to operate helicopters to any point within 50 miles of Midway Airport, Chicago, and has since 1949, as Helicopter Air Service, Inc., been operating shuttle mail services between the roof of the main Chicago post office and Chicago Municipal Airport. This shuttle is operated at high frequency and, in addition, a number of mail flights are made on weekdays over three circuits, each of which serves a large area. Under its new title the company began scheduled passenger services on November 12, 1956, between O'Hare and Midway Airports, Chicago.
Head Office: Chicago, Ill., U.S.A.
Executives: John S. Gleason, Jnr., president/treasurer; C. W. Moore, executive vice-president; John C. Brogan, vice-president/secretary; Robert S. Angstadt, vice-president operations; Robert B. Kiel, asst. secretary/treasurer.
Fleet: three S-55, six Bell 47G; on order: three S-58 (1957).
Results for year ended December 31, 1956: 876 passengers; 1,381,954 kg of mail carried; total costs, £226,390; total revenue, £225,483: 74 staff.

Cia. Itau de Transports Aereos, was founded in 1947 to operate all-cargo services between the main Brazilian cities. Operations between Sao Paulo and Rio de Janeiro began in 1948 and by 1954 the company operated more than 3,700 miles of routes. Itau was based on Sao Paulo and used a fleet of C-46s. There is no recent news of this company and it is not known whether it is still in operation.

CINTA—Cia. Nacional de Turismo Aereo (Chilean Airlines), is a new company operating

American Airlines, the world's largest air passenger carriers, still operate a fleet of more than 70 Convair CV-240s, one of which is seen here over Niagara Falls.

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low-fare services between Santiago and Miami *via* Arica, Talara and Panama. C-46s were used to open this service but it is now believed to be operated with DC-4s purchased from United Air Lines.

Head Office: Santiago, Chile.
Executives: A. Ossa, president; J. Costabal, general manager; C. Vallejo, secretary general; K. Rosene, technical manager.
Fleet: two DC-4, C-46, DC-3, Lockheed 10, Bonanza.

Civil Air Transport was founded by Maj-Gen. Chennault, leader of the A. V. G. Flying Tigers, and Whiting Willauer on October 25th, 1946, as C.N.R.R.A. Air Transport for the carriage of famine relief supplies to China. From 1947 commercial loads were allowed on return flights. After a series of moves forced by the Communist advance through China C.A.T. moved to Formosa in 1950. The airline, in addition to charter work in various parts of the world, operates round-the-island passenger and cargo services and international flights to Japan, South Korea, Manila, Hong Kong and Bangkok.

Head Office: Taipei, Taiwan (Formosa).
Executives: Wang Wensan, chairman; H. L. Grundy, managing director; H. B. Newell, treasurer/controller; W. M. French, secretary.
Fleet: two DC-4, 23 Curtiss C-46, five DC-3, two PBY Catalina.
Results for year ended December 31 1955: 103,577 passengers; 17,232 tons of freight and 174 tons of mail carried; 4,866,013 ton-miles flown; 2,598 staff. Financial details not available.

Commercial Air Services (Pty.), Ltd., was founded in 1943 as a charter operator. Regular services were begun in 1948. At present C.A.S. flies twice a week between Bulawayo and Wankie *via* Dett; 11 times a week Johannesburg - Welkom; and once on Saturdays Welkom - Durban. The scheduled services are flown by Lodestar and Cessna 170 aircraft.

Head Office: Johannesburg, Transvaal, Union of South Africa.
Executives: J. M. S. Martin, operations manager; L. Zimmerman, commercial manager.
Fleet: Lodestar and Cessna 170 on scheduled services.
Traffic statistics not available.

Compagnie de Transports Aériens Intercontinentaux—T.A.I. was formed after World War II as a charter operator, closely associated with shipping companies, and later established regular scheduled services to various parts of Africa, Madagascar and Saigon. A redistribution of French air routes became effective on January 1 this year and T.A.I. has been allotted 60 per cent of the traffic between France and North Africa and the eastern part of French West Africa; 50 per cent to Djibouti, Madagascar and Reunion; and 10 per cent between France and Morocco.

The company has also been made responsible for the development of French services to Indonesia, Ceylon, Australia and New Caledonia. The Air France services to Australia and New Caledonia were taken over in 1956 and early this year a new route was opened to New Zealand.

Head Office: Paris, France.
Executives: P. Bernard, president; General G. Fayet, director-general; M. Mathieu, secretary - general; M. Gaffie, commercial director.
Fleet: four DC-6B, two DC-4. On order: two DC-7C (December 1957), five DC-8.
Results for year ended December 31 1955: 45,364 passengers; 1,650 tons of freight and 292 tons of mail carried; 33,344,000 ton-km flown; 700 staff. Financial details not available.

Compagnie Générale de Transports Aériens Air Algérie was formed in 1953 by the merging of the original Air Algérie and Cie. Air Transport. The controlling interest in C.G.T.A. Air Algérie is held by Cie. Gle. Transatlantique in association with Cie. de Navigation Mixte. Services are operated within Algeria and from Algeria to Palma, numerous places in France and to Geneva.

Head Office: Algiers, Algeria.
Executives: J. Lignel, president; L. Adida, general manager.
Fleet: three Constellation, four DC-4, three DC-3, two SO 30P Bretagne.
Results for year ended December 31 1955: 163,802 passengers; 1,746,000 freight ton-km flown; 41,000 mail ton-km flown; total ton-km, 16,385,000; 443 staff. Other details not available.

Compagnie Haitienne de Transport Aérien (COHATA) is the recent successor to Corps d'Aviation de l'Armée d'Haiti, a military transport organization founded in 1942, and which began mail carriage in the following year and passenger services in 1944. The new airline is operating domestic services.

Head Office: Port au Prince, Haiti.
Executives: not known.
Fleet: DC-3, Stratoliner.
Traffic statistics not available.

Compagnie Nationale AIR FRANCE is believed to have the greatest unduplicated route mileage of any airline. The company was formed in August 1933 by the merging of Air Union, S.G.T.A., and C.I.D.N.A. and the purchase of Aéropostale. Some of the Air France constituents can claim operating experience back to 1919. French air transport has a great history and was early in establishing European air services and services to Africa. The pioneering by French airlines of mail services in South America and later across the South Atlantic is one of the great stories of aviation. In addition to these routes a system of Mediterranean services was established and the route to Indo-China was opened as early as 1932. Air France now has about 170,000 miles of routes in Europe and Africa and to North and South America, the Near, Middle and Far East. Operations range from the *de luxe* services to America and the Far East (with Super Constellations) to what might be termed desert bus services. The company also operates the French internal night mail services, which have achieved a very high standard of regularity and reliability frequently in extremely bad weather when all other flying has ceased.

Head Office: Paris, France.
Executives: M. Hymans, chairman; L. Lesieux, president; M. Lemoine, vice-president; R. Dupre, vice-president technical; R. Montarnal, vice-president economics.
Fleet: 14 L-1049G, nine L-1049E, 17 L-749A, 11 Viscount, 12 Provence, 21 DC-4, 41 DC-3. On order: 10 L-1649A (1957), 12 Caravelle (1958/60), 17 Boeing 707 (1959/60).
Results for year ended December 31, 1956: 2,332,066 passengers; 56,437,527 kg of freight and 15,966,863 kg of mail carried; 360,047,241 ton-km flown; 17,918 staff. Financial details not available.

Compania Aeronautica Uruguaya, S.A.—Causa, was founded in 1936 and in 1938 opened a route between Montevideo and Buenos Aires, using Junkers—Ju52/3m floatplanes. In 1943 Causa opened a second route across Rio de la Plata, from Colonia to Buenos Aires. Sandringham flying-boats are used on both routes. The Montevideo - Buenos Aires route is flown in pool with Aerolineas Argentinas, with the Uruguayan company flying 10 services a week. The Colonia route is flown once each way on weekdays.

Head Office: Montevideo, Uruguay.
Executives: J. A. Beisso, president; T. L. Borges, managing director; O. M. Rodriquez, secretary.
Fleet: Short Sandringham.
Traffic statistics not available.

Compañia Cubana de Aviación, S.A.—Cubana, was founded in 1929 as Compañia Nacional Cubana de Aviación Curtiss, S.A., for the operation of a school and charter services. Scheduled services were begun in 1930. Pan American obtained 100 per cent control of the company in 1932. P.A.A.'s holding was subsequently much reduced until in 1953 it was only 20 per cent, and it has now withdrawn from Cubana. The company now flies domestic services and also routes to Mexico, U.S.A., Haiti, Bermuda, Portugal and Spain. In order to meet the fierce competition in the area, Cubana has now introduced Viscounts.

Head Office: Havana, Cuba.
Executives: J. L. Vilaboy, president; J. M. Palli Diaz, vice-president/general manager; I. Calderin, treasurer.
Fleet: two L-1049G, three Viscount 755, two Constellation, six DC-3. On order: one L-1049G, four Viscount 810.
Results for year ended December 31 1955: 227,061 passengers; 1,479,000 freight ton-km and 151,000 mail ton-km flown; total ton-km, 13,658,000; 715 staff. Financial details not available.

Compañia de Aviación "Faucett" S.A., is one of the oldest South American airlines, having been founded in 1928. The company now flies over 4,000 miles of internal routes and it is one of the few airlines which operates aircraft of their own manufacture: about 30 Faucett-built Stinsons were produced, and four or these are still used by the airline. The company's honorary president was the original founder.

Head Office: Lima, Peru.
Executives: E. J. Faucett, hon. president; E. Dibos, president of the board; A. Bentin, managing director.
Fleet: four DC-4, seven DC-3, four Stinson-Faucett.
Results for year ended December 31, 1956: 146,048 passengers; 13,078,727 kg of freight and 513,603 kg of mail carried; 330 staff. Other figures not available.

Chicago Helicopter Airways operate their scheduled passenger services linking the Chicago airports and downtown Chicago with a fleet of Sikorsky S-55s.

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A Delta Air Lines' Lockheed Constellation. As on all other Delta aircraft the engine cowlings are painted dark blue and bear the airline's name.

Compañia Dominicana de Aviacion, S.A., was founded in 1944 by local interests and Pan American Airways. Scheduled domestic operations began that year. The company has a domestic route network and also flies from Ciudad Trujillo to Port au Prince in Haiti and to Miami, Florida.
Head Office: Ciudad Trujillo, Dominican Republic.
Executives: C. A. McLaughlin, president/general manager; G. M. Burrie, vice-president.
Fleet: DC-3, C-46.
In 1953 the company carried 19,200 passengers, 1½ tons of mail and 3 tons of freight.

Compañia Mercantil Anónima IBERIA, Lineas Aéreas Españolas, was established in 1940 as successor to L.A.P.E. Originally the Spanish Government owned 51 per cent of the capital with other Spanish interests and Deutsche Lufthansa holding the other 49 per cent. All stock was subsequently acquired by the Government. Iberia began as a domestic operator but now has in addition to its internal services others to London, Paris, Frankfurt, Geneva, Rome and Lisbon. Long distance services are operated to New York, Mexico, Venezuela, Buenos Aires and Spanish possessions in Africa and off the coast of that continent.
Head Office: Madrid, Spain.
Executives: D. Tomás Delgado, chairman; D. C. G. Lucia, gen. mgr.; F. Iglesias, chief engineer; J. M. Ansaldo, chief flight operations; J. Viniegra, general secretary.
Fleet: three L-1049, six DC-4, 17 DC-3, four Bristol 170; on order two L-1049G (August 1957), five Convair 440 (in course of delivery).
Results for year ended December 31, 1956: 673,343 passengers; 1,600,000 kg of freight and 870,000 kg of mail carried; 43,404,494 ton-km flown; 2,520 staff. Financial details not available.

Compañia Mexicana de Aviacion, S.A., was founded on August 20, 1924, to carry pay-roll gold from Tampico to the oil fields in the State of Veracruz, thus avoiding the bandits who had been attacking the paymasters travelling by surface. The original fleet consisted of single-engined Lincoln Standard biplanes. In 1929 Pan American Airways acquired 100 per cent of C.M.A.'s stock but this holding was subsequently considerably reduced. C.M.A., now the main Mexican airline, operates a network of services within Mexico and to Los Angeles and Havana. Scheduled freight services are also operated within Mexico and to Los Angeles.
Head Office: Mexico, D.F.
Executives: A. Sáenz, president; P. A. Chapa, vice-president; C. F. Osuna, vice-president; R. I. Pérez, treasurer; A. Flores, secretary; E. R. Silliman, general manager; M. H. Jones, operations manager; F. O. Willy, traffic and sales manager .
Fleet: six DC-6, six DC-4, 19 DC-3, three Fairchild C-82A. On order: four DC-7C (in course of delivery).
Results for year ended December 31, 1956: 543,400 passengers; 17,333,637 kg of freight and 713,067 kg of mail carried; 60,971,634 ton-km flown; total costs, £5,508,134; total revenue, £5,803,626; 3,065 staff.

Compania Panamena de Aviacion, S.A.—COPA., an affiliate of Pan American World Airways, was founded in 1944 by P.A.W.A. and Panamanian interests, with the U.S. line holding 40 per cent of the stock. This holding has since been reduced. Scheduled services were begun in 1948. The company now operates a system serving various points in Panama and San Jose in Costa Rica and Bogota, Colombia.
Head Office: Panama City, Panama.
Executives: R. Arias, president; R. Huertematte, secretary; F. Icaza, treasurer.
Fleet: DC-3, C-46.
Traffic statistics not available.

Connellan Airways, Ltd., became a limited company in 1951 but operations were begun in August 1939 when E. J. Connellan started flying a fortnightly 1,184-mile route serving nearly a score of places between Wyndham and Alice Springs; he used a Percival Gull. Now the company operates extensive local services based on Alice Springs and the unduplicated route mileage is about 8,000.
Head Office: Alice Springs, N.T., Australia.
Executives: E. J. Connellan, governing director; I. M. Leslie, manager.
Fleet: two D.H.89, two Beech 18, one Beech 17, two Tiger Moth, one Cessna 180. On order: one Cessna 180 (May 1957).
Results for year ended December 31, 1956: 113 passengers; 4,763 kg of freight and 2,744 kg mail carried; total costs, £85,000; total revenue, £93,000; 30 staff.

Continental Air Lines, Inc., counts its history as dating from July 15, 1934, when Varney Speed Lines began a service between El Paso and Pueblo with Lockheed Vegas. In December that year the Southwest Division of Varney Speed Lines became Varney Air Transport and on July 1, 1937, the company became Continental Air Lines. Earlier in 1937 the Denver - Pueblo route of Wyoming Air Service (Inland Air Lines) was purchased. The company's latest acquisition, in 1954, was Pioneer Air Lines, which began service in 1945. Pioneer's routes measured 2,000 miles and served 22 cities in Texas and New Mexico. Continental now serves a population of 19 million people in the area bounded by Kansas City and Denver in the north and El Paso and Houston in the south. Throughplane agreements give access to Seattle, California, and St. Louis.
Head Office: Denver, Colorado, U.S.A.
Executives: L. H. Mueller, chairman; R. F. Six, president; C. C. West, jnr., exec. vice-pres.; O. R. Haueter, vice-president operations; C. H. Calhoun, vice-president, engineering and maintenance; J. A. Uhl, vice-president/treasurer; S. B. Redmond, secretary.
Fleet: five DC-3, six Convair 340, three Convair 440, three DC-6B; leased aircraft, 10 DC-3, one DC-6B, one DC-6; on order: five DC-7B (1957), 15 Viscount 810D (1958), four Boeing 707 (1959).
Results for year ended December 31, 1956: 706,969 passengers; 2,594,297 kg of freight and 2,022,729 kg of mail carried; 27,301,864 ton-miles flown; total costs, £6,183,621; total revenue, £6,624,330; 1,423 staff.

COPA—see Compania Panamena de Aviación, S.A.

Cordova Airlines, Inc., began operations in 1934 and now operates services in the Anchorage - Cordova - Seward area and as far north as Fairbanks.
Head Office: Anchorage, Alaska.
Executives: M. K. Smith, president; J. M. Stern, traffic and sales manager.
Fleet: DC-3, Cessna 170, Cessna 180, Grumman Widgeon on scheduled services.
In 1953 the company carried nearly 10,000 passengers and flew a total of 168,000 revenue ton-miles.

Correio Aereo Nacional is a transport branch of the Brazilian armed services and it is responsible for the operation of air services to areas of Brazil which would not justify commercial airline operation. Operations were begun in 1931 and by 1954 more than 45,000 miles of routes were in operation. In addition to domestic operations this military airline serves points in Bolivia, French Guiana, Paraguay, Peru and Uruguay.
Fleet: Approx. 40 DC-3, 20 Beech 18, eight Bonanza, two Canso.
Traffic in 1955 is believed to have been about 4,000,000 passengers, 100,000,000 kg of cargo and 4,000,000 kg of mail carried.

Cruzeiro—see Serviços Aéreos Cruzeiro do Sul, Ltda.

Cubana—see Compañia Cubana de Aviación, S.A.

Currey Air Transport Ltd. is registered as a U.S. supplemental air carrier and has advertised scheduled services serving Oakland, Burbank, San Diego, St. Louis, Chicago, Detroit, Philadelphia, New York and Boston. The company advertises that it is represented by Trans Continental Airlines Agcy. Corp. It is believed that the operation of Trans American, North American and Trans Continental Airlines were part of the Currey Air Transport operation.
Head Office: Burbank, Cal., U.S.A.
Executives: A. R. Currey, president; R. M. Smith, vice-president.
Fleet: DC-6B, DC-4.

Cyprus Airways, Ltd., was founded in 1947 by B.E.A., the Cyprus Government and private interests. The British airline holdings are now 23 per cent each by B.E.A. and B.O.A.C. The company operates DC-3s on routes within the Middle East. In addition, B.E.A. provides Viscounts under a hire agreement for certain services between Nicosia and Beirut, Nicosia and Athens and Nicosia and Tel Aviv. These form part of the joint operation of the B.E.A./Cyprus Airways London - Athens - Nicosia/Beirut/Lydda route.
Head Office: Nicosia, Cyprus.
Executives: Dr. C. Raeburn, chairman; J. A. Vick, general manager; B. G. Cooper, secretary; S. M. Killingbeck, commercial manager; J. G. Williams, chief engineer.
Fleet: four DC-3. On order: two Viscount 700.
Results for year ended December 31, 1956: 27,576 passengers; 636,639 kg of freight and 420,644 kg of mail carried; 2,632,020 ton-km flown; 157 staff. Financial details not available.

"De Kroonduif"—see Nederlands Nieuw Guinea Luchtvaartmaatschappij "De Kroonduif" N.V.

Delta Air Lines, Inc., re-entered the airline business in 1934 after a break of four years following its pioneering of services in 1929 between Birmingham and Dallas. In 1953 the company took over Chicago and Southern Air Lines (founded in 1934) and for some time the company worked as Delta-C & S Air Lines. Delta has an extensive network stretching from New York, Detroit and Chicago in the north to Houston, New Orleans, Miami, Havana, San Juan and Caracas in the south. Westwards the network goes to Kansas City, Dallas and Fort Worth, while throughplane agreements provide service to Los Angeles, San Diego and San Francisco.
Head Office: Atlanta, Ga., U.S.A.
Executives: C. E. Woolman, president/gen. mgr.; R. W. Freeman, chairman of the board; L. C. Parker, vice-pres. traffic and sales; C. H. Dolson, vice-president operations; T. G. Cole, vice-president finance.
Fleet: 11 DC-7, 20 Convair 340, seven DC-6, four Constellation, six Convair 440, two C-46, 14 DC-3; on order: two CV-440 (1957), 10 DC-7 (1958), eight DC-8 (1959/60), 10 Convair 880 (1959/60).
Results for year ended December 31, 1956: 2,606,945 passengers; 13,093,270 kg of freight and 6,804,000 kg of mail carried; total costs,

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One of Eastern Air Lines' attractively painted fleet of Douglas DC-7Bs.

£23,372,219; total revenue, £25,837,101; 5,294 staff.

D.E.T.A.—see Divisao de Exploraçao des Transportes Aéreos.

Deutsche Lufthansa. This is a new company, not to be confused with the West German airline, which was set up in 1955 under an agreement between the East German Democratic Republic and the U.S.S.R. The company receives technical assistance from the U.S.S.R. Services are operated from Berlin to Bucharest, Belgrade, Moscow, Prague, Sofia, Warsaw and Wilno.
Head Office: Berlin, German Democratic Republic.
Fleet: Il-14. No other details available.

Deutsche Lufthansa, A.G. describes itself as "a new airline with an old tradition." This is apt, as although the new airline began internal operations on April 1, 1955, services to London on May 16 and to New York on June 8 that year, the original D.L.H. was founded in January 1926 and its winged crest originated with the Deutsche Luftreederei in 1919.

The new Lufthansa operates a small internal network, European services to London, Paris, Madrid and Lisbon, North Atlantic services to New York, Montreal and Chicago, South Atlantic services to Brazil and Argentina, and Middle East services to Lebanon, Syria, Iraq and Persia.

B.E.A. is assisting with the operation of the Convairs and T.W.A., Lockheed and Transocean Air Lines with the Super Constellation flights.

Head Office: Cologne, Germany.
Executives: H. M. Bongers, managing director; Dipl. Ing. G. Höltje, technical director.
Fleet: eight L-1049G, four Convair 340, two DC-3; on order: nine Viscount V.814 (1958/59), five Convair 440 (1957), two Twin Bonanza (1957), four L-1649A (1957/58), four Boeing 707 (1960/61).
Results for year ended December 31, 1956: 228,680 passengers; 1,961,000 kg of freight and 1,056,000 kg of mail carried; 34,000,000 ton-km flown; 3,457 staff; total costs, £8,330,000; total revenue, £6,750,000.

Divisao de Exploraçao des Transportes Aéreos—D.E.T.A. was organized in 1936 by the Colonial Government of Moçambique as a division of the Department of Railways, Harbours and Airways. Domestic services are operated and there are routes to Durban, Johannesburg and Salisbury.

Head Office: Lourenço Marques, Moçambique.
Executives: A. P. Pereira Leite, director general; A. H. Pinho da Cunha, manager; M. A. Cardosa Barata, acting manager.
Fleet: three DC-3, two Lodestar, six Dove, two Ju 52/3m, four D.H.89, one D.H.90, two D.H.87.
Results for year ended December 31, 1955: 18,913 passengers; 475 tons of freight and 93 tons of mail carried; 1,474,000 ton-km flown; 721 staff.

Divisao dos Transportes Aéreos—DTA was founded in 1938 as a division of the Ports, Railways and Transport Administration. Operations began in 1938 and at present DTA operates a network of domestic services and also a route between Luanda and Leopoldville. During 1951 the Leopoldville route was extended to Lourenço Marques but was abandoned as a result of poor load factors.

Head Office: Luanda, Angola.
Executives: R. Serrão, president; J. de S. Medina, managing director.
Fleet: five DC-3, four Beech 18, seven D.H.89.
Results for year ended December 31, 1955: 26,137 passengers; 167,000 freight ton-km and 62,000 mail ton-km flown; total ton-km, 1,491,000; 345 staff. Financial details not available.

East African Airways Corporation came into being in 1946; it is responsible for the development of air transport in the three territories of Kenya, Uganda and Tanganyika and each Territory is represented on the board, as is B.O.A.C. The corporation is successor to the pre-war Wilson Airways. E.A.A.C. operates a network of services in the three Territories and to South Africa, with a route mileage of more than 20,000. Freight services, begun in 1954, have already expanded.

The corporation is to take over some B.O.A.C. Argonauts for use on its main services and will also use these on a new route to London.

Head Office: Nairobi, Kenya.
Executives: Col. M. C. P. Mostert, general manager; A. V. Gill, asst. gen. mgr./secretary; Capt. E. E. Morris, operations manager; A. E. Robinson, engineering manager; P. A. Travers, sales manager; A. G. Molison, manager stations and traffic; S. G. Choppin, chief accountant.
Fleet: nine DC-3s, four D.H.89; on order, three Argonaut (1957).
Results for year ended December 31, 1956: 106,162 passengers; 2,463,800 kg of freight and 393,300 kg of mail carried 5,743,797 ton-km flown; total costs (estimated), £1,191,400; total revenue (estimated), £1,186,800; 1,308 staff.

Eastern Air Lines, Inc., is one of the largest U.S. carriers and its history goes back to 1927 when Pitcairn Aviation successfully bid for a mail contract between New York and Atlanta. The carrier's name became Eastern Air Transport in 1930, following North American Aviation's acquisition of Pitcairn in the previous year. New York Airways and Ludington Air Lines were acquired in 1931 and 1933 respectively. North American sold its holdings in 1938.

E.A.L. now has an extensive route system throughout the Eastern States serving Boston, Detroit and Chicago at the northern extremities; St. Louis, Memphis and San Antonio in the west; and Mexico City and Puerto Rico at the southwest and southeast corners of the network. Throughplane service with Braniff reaches to Rio de Janeiro and Buenos Aires *via* the west coast of South America. Other throughplane services extend to Minneapolis/St. Paul, Kansas City and Denver. Eastern, after a long fight, acquired Colonial Airlines in June 1956 thus gaining routes to Ottawa, Montreal and Bermuda.

Head Office: New York, U.S.A.
Executives: E. V. Rickenbacker, chairman/general manager; T. F. Armstrong, president; P. H. Brattain, first vice-president; T. E. Creighton, treasurer; F. L. Farley, secretary.
Fleet: 40 DC-7B (in course of delivery), 18 Constellation, 29 L-1049, 10 L-1049G (in course of delivery), 59 Martin 4-0-4, unknown number of DC-4. On order: 40 Electra, 18 DC-8 (1959-60), 15 Convair 440.
Results for year ended December 31, 1956: 7,673,411 passengers; 458,913,861 revenue ton-miles flown. Other details not available.

East-West Airlines, Ltd., founded in 1947 to provide feeder services between inland districts and Brisbane and Sydney. Services between Tamworth and Sydney were opened in that year and to Brisbane in 1948. The airline now serves eight inland points on this route and also operates services from Sydney to Cowra, Temora and West Wyalong.

Head Office: Tamworth, N.S.W., Australia.
Executives: D. M. Shand, chairman; Capt. A. J. Smith, general manager; R. O. Cooksey, administration manager; J. G. Riley, operations manager.
Fleet: DC-3,
Results for year ended December 31, 1955: 54,715 passengers; 811 tons of freight and four tons of mail carried; 1,344,000 ton-miles flown; 101 staff. Financial details not available.

El Al Israel Airlines, Ltd., was incorporated in November 1948 and began services to European cities, including London, in 1949. Routes to the U.S.A. and the Union of South Africa were opened in 1951. The Government of Israel has the majority holding in El Al; the shipping company Zim Israel Navigation Co., Ltd., also has a financial interest in the airline.

Head Office: Tel Aviv-Yafo, Israel.
Executives: L. A. Pincus, managing director; Y. Palgi, deputy managing director (production and operations); Dr. A. Rywkind, deputy managing director (commercial).
Fleet: five L-049 Constellation, three Curtiss C-46, one Consul (training). On order, three Britannia 313 (1957).
Results for year ended December 31, 1955: 34,462 passengers; 700 tons of freight and 130 tons of mail carried; 15,802,000 ton-km flown; 1,100 staff. Financial details not available.

Ellis Air Lines was incorporated in 1940 but operations had been started as far back as 1936, when R. E. Ellis began flying with one Waco biplane. Routes are operated from Ketchikan to as far north as Sitka and Juneau. In 1952 a southward extension from Ketchikan to Prince Rupert gave Ellis Air Lines its first international operation.

Head office: Ketchikan, Alaska.
Executives: R. E. Ellis, president; J. L. Sherman, vice-president maintenance; G. A. Bodding, vice-president operations.
Fleet: Goose.
Results for year ended December 31, 1954: 52,500 passengers; 800 tons of freight and mail carried; 45,000 freight and mail ton-miles flown; 96 staff.
Financial details not available.

Empresa Guatemalteca de Aviacion—AVIATECA, was formed by the Guatemala Government in 1945 to take over Aerovias de Guatemala, which had been founded in 1939, and which began operating in 1940. The company operates about 3,700 miles of routes radiating from Guatemala City.

Head Office: Guatemala City.
Executives: Col. R. Mendoza, president; Lt-Col. A. Castaneda, operations manager.
Fleet: one DC-4, six DC-3, one Norseman. On order: six DC-3, one DC-4.
In 1954 Aviateca carried about 64,000 passengers and 3,500 tons of freight and mail; 234 staff.

Ethiopian Air Lines, Inc., is owned by the Ethiopian Government and managed by T.W.A. Services were begun in April 1946 and the present operations include services within Ethiopia and to Aden, Nairobi, Khartoum, Jeddah, Cairo and Athens. E.A.L. was for a time one of the few airlines using rocket-assisted take-off for passenger aircraft, a practice now discontinued.

Head Office: Addis Ababa, Ethiopia.
Executives: H. E. Lij Araya Abebe, president and chairman; H. E. Ato Menasse Lemma, vice-president; V. H. Harrell, Jnr., general manager; M. F. Garrison, secretary/treasurer; H. F. Noon, acting general operations manager; D. P. Reid, general sales manager.
Fleet: three Convair 240, eight DC-3; on order, one L.749 Constellation (1957), three DC-6B (1958).
Results for year ended December 31, 1956: 69,208 passengers; 5,061,599 kg of freight and 74,309 kg of mail carried; 15,768,723 ton-km

flown; total costs, £1,397,857; total revenue, £1,513,428; 655 staff.

Far Eastern Airlines is a subsidiary of the manufacturing agents C. Itoh. At the end of 1953 the company was awarded the right to operate feeder services from Osaka. Present routes are from Osaka to Matsuyama, Iwakuni, Fukuoka, Miyazaki, Kochi and Yonago.
Head Office: Osaka, Japan.
Executives: W. Kanno, president; Admiral T. Nakamura, general manager.
Fleet: two Dove, two Marathon. On order: two DC-3.
Results for year ended December 31, 1956: 45,295 passengers; 35,259 kg of freight and 36,646 kg of mail carried; 756,127 ton-km flown; direct operating costs, £129,967; total revenue, £147,125; 151 staff.

Faucett—see Compañia de Aviación-Faucett.

Federation Air Service began operation, in November 1951, of local services based on Kuala Lumpur. These link up numerous isolated areas and also act as feeder services to the routes of Malayan Airways, with which Federation Air Service is in association.
Head Office: Kuala Lumpur, Malaya.
Fleet: six Beaver.
No details of traffic and financial results are available.

Fiji Airways was founded in 1951 by Harold Gatty, who flew round the world in a Lockheed Vega with Wiley Post in 1931—they took just under nine days. Regular services within Fiji were begun in September 1951 using D.H.89s. Services are now operated between Nandi, the International Airport, Suva and Savusavu, Lambasa and Taveuni.
Head Office: Suva, Fiji.
Executives: Harold Gatty, managing director; Len Dobbin, manager/chief engineer; Pete Frame, chief pilot.
Fleet: three Drover.
Results for year ended December 31, 1956: 20,108 passengers; 132,090 kg of freight and 53,204 kg of mail carried; 25 staff. Financial details not available.

Finnair—see Aero O/Y.

Flugfélag Islands h.f. (Icelandair), founded in 1937 as Flugfélag Akureyrar and began operation with one Waco biplane on floats. The present company name was adopted in 1940 and the name Icelandair has recently replaced the title Iceland Airways. In 1946 the company began services to Scandinavia and the United Kingdom. These were operated by Scottish Aviation for Iceland Airways until 1948 when the company introduced its own DC-4 aircraft. DC-3s and flying-boats serve a score of places in Iceland and DC-4s operate from Reykjavik to Copenhagen, Hamburg, Glasgow and London. Viscounts were added to the fleet in March this year.
Head Office: Reykjavik, Iceland.
Executives: O. O. Johnson, general manager; J. R. Snorrason, chief pilot; B. Tomasson, chief engineer; S. K. Matthiasson, traffic manager (international); H. Sigurdsson, traffic manager (domestic); S. Thorbjornsson, chief accountant; N. Simonarson, public relations officer.
Fleet: two Viscount 759, two DC-4, four DC-3, two PBY-5A Canso, one Goose.
Results for year ended December 31, 1956: 70,020 passengers; 1,492,691 kg of freight and 169,236 kg of mail carried; 2,811,801 ton-km flown on international services; 205 staff. Financial details not available.

Flying Tiger Line Inc., The. Founded in June 1945 as National Skyway Freight Corporation. In addition to non-scheduled flying Flying Tiger Line operates coast-to-coast scheduled freight services. DC-6A flights include San Francisco-Chicago-Detroit-New York; Los Angeles-Chicago-New York; New York-Los Angeles non stop; and Detroit-Los Angeles-San Francisco, all operated every weekday. C-46s serve the following additional cities: Seattle, Portland, Minneapolis/St. Paul, Milwaukee, Cleveland, Buffalo, Binghamton, Philadelphia, Hartford and Boston. In 1954 an attempt to merge with Slick Airways had to be abandoned because of financial problems involved.
Head Office: Burbank, Cal., U.S.A.
Executives: R. W. Prescott, president; F. Benninger, secretary; W. E. Bartling, vice-president operations.
Fleet: six DC-4, seven DC-6A, 23 C-46, 10 L-1049H (in course of delivery).
In 1954 Flying Tiger Line flew 25,000,000 revenue ton-miles.
No other details available.

Frontier Airlines, Inc., acquired in June 1950 the temporary certificates of Arizona Airways, Challenger Airlines and Monarch Airlines, and is now operating a network of 3,500 miles in Colorado, Arizona, New Mexico, Utah, Wyoming, Montana and North Dakota.
Head Office: Denver, Colorado, U.S.A.
Executives: L. E. Leverone, chairman; C. A. Myhre, president; E. N. Levin, secretary; L. P. Blatter, treasurer; J. D. Lindsay, vice-president traffic and sales.
Fleet: 14 DC-3. On order: two Friendship and option on four.
Results for year ended December 31, 1956: 197,902 passengers; 19,721 kg of freight and 75,187 kg of mail carried; 6,218,016 ton-miles flown; total costs (estimated), £2,117,857; total revenue (estimated), £2,196,428; 680 staff.

A Fiji Airways' Australian-designed and built de Havilland Drover seen in typical national surroundings. Three aircraft of this type are operated in Fiji.

Garuda Indonesian Airways N.V. is the State-owned Indonesian airline, which had been formed by the Government and K.L.M. as successor to K.L.M.'s post-war operations in the area and the pre-war K.N.I.L.M. Nationalization took place in 1954 when K.L.M.'s shares were bought up. Services are operated within and between the islands of the republic and to Singapore, Bangkok and Manila.
Head Office: Djakarta, Indonesia.
Executives: Dr. M. Soetoto, president; Dr. R. Sugoto, and D. K. van Houten, joint managing directors.
Fleet: 14 Heron, 12 DC-3, eight Convair 340, eight Convair 240.
Results for year ended December 31, 1955: 402,292 passengers; 9,100 tons of freight and 2,400 tons of mail carried; 26,431,000 ton-km flown; 3,240 staff. Financial details not available.

Gibbes Sepik Airways, Ltd., are operators of scheduled and non-scheduled services in New Guinea. Junkers Ju52/3ms purchased from Sweden were introduced into service in 1956.
Head Office: Goroka, Territory of New Guinea.
Executives: R. H. Gibbes, managing director; M. J. C. Gibbes, director; V. W. Cox, general manager/secretary; R. H. S. Gray, operations manager; E. Cross, chief engineer.
Fleet: six Norseman, three Ju52/3m; on order: two Cessna 180 (1957).
Results for year ended December 31, 1956: 15,724 passengers; 2,371,385 kg of freight and 63,608 kg of mail carried; 105 staff. Financial details not available.

Gibraltar Airways, Ltd., formed in 1947 as a B.E.A. subsidiary with B.E.A. holding 51 per cent of the stock and M. H. Bland and Co., Ltd., holding the remainder. Operations between Gibraltar and Tangier and later to Spain and Spanish Morocco were maintained by D.H.89 aircraft. In October 1953 an agreement was concluded whereby B.E.A. undertakes all flying operations with a DC-3. Gibraltar Airways now operates only between Gibraltar and Tangier but the DC-3 also flies connecting services between Gibraltar and Madrid on certain days, thus providing higher frequency services to and from London.
Head Office: Gibraltar.
Executives: Sir George Gaggero, O.B.E., chairman; The Earl Amherst, M.C., deputy chairman.
Fleet: one DC-3 owned and operated by B.E.A.
Results for year ended December 31, 1955: 17,483 passengers; 20 tons of freight and 21 tons of mail carried; 2,050 freight and mail ton-miles flown; operating surplus, £3,971.

Grupo del Transportes is believed to be operating domestic services in Peru.
Head Office: Lima, Peru.
Executives: Col. C. Ramos, director; Capt. H. Diaz, technical manager.
Fleet: DC-3, D.H.89, Stinson, Beechcraft, Canso, Beaver.
No other details available.

Guest Aerovías México, S.A. was founded in 1946 and in 1948 the company opened a service to Madrid but this was later abandoned. The company flies twice weekly between Mexico City and Windsor/Detroit. Constellations purchased from Qantas are used on this route, as well as on the daily service from Mexico to Miami. A DC-4 flies a once weekly service between Mexico and Panama. The company trades as Guest Airways Mexico.
Head Office: Mexico City, Mexico.
Executives: Winston Guest, president; G. L. Monteiro, vice-president/general manager; D. Mayagoitia P., asst. vice-president/general manager.
Fleet: one DC-4, two L.749A Constellation, two C-82 Packet.
Results for year ended December 31, 1956: 36,632 passengers; 359,474,000 kg of freight and 38,762,000 kg of mail carried; total ton-km flown 50,128,000. Financial details and number of staff not available.

Guest Airways—see Guest Aerovías México, S.A.

Guinea Airways, Ltd., now operate services mainly in South Australia with Adelaide as its headquarters. Originally formed in 1927, the company did remarkable work in the New Guinea goldfields until this was ended by the Japanese. A route had also been established from Darwin to Adelaide. After the war the

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newly formed State-owned Trans-Australia Airlines drove Guinea Airways off this route and caused its decline to the status of a small operator.

Head Office: Adelaide, South Australia.
Executives: S. Powell, chairman; C. A. Window, secretary; Capt. N. S. D. Buckley, chief pilot.
Fleet: five DC-3, two Auster.
Results for year ended December 31, 1956: 94,292 passengers; 1,433,677 kg of freight and 92,460 kg of mail carried; other details not available.

Gulf Aviation Co., Ltd., was formed in 1950 by Mr. F. Bosworth. The company became a subsidiary of B.O.A.C. in the following year. Eighteen services a week are operated between Bahrein and Dhahran and there are also services from Bahrein to Doha, Abu Dhabi, Sharjah and Muscat.

Head Office: Bahrein.
Executives: G. B. Thompson, chairman; E. H. W. Lewis, executive director/secretary; K. H. N. Bulmer, chief pilot; E. C. Evemy, chief engineer.
Fleet: four Dove, two Heron.
Traffic figures and financial results not available.

Hawaiian Airlines, Ltd., was founded in January 1929 as Inter-Island Airways. The Inter-Island Steam Navigation Company held 76 per cent of the original stock, services were begun in November 1929 and Sikorsky amphibian biplanes were used. The present title was adopted in 1941 and it was in that year that DC-3s were first introduced. The airline's services link Hawaii, Maui, Lanai, Molokai, Kauai and Honolulu on Oahu.

Head Office: Honolulu, Hawaii.
Executives: Stanley C. Kennedy, chairman; Arthur D. Lewis, president; Brian Cooke, vice-president/treasurer; Lionel D. Machado, vice-president operations; Jack C. Tobin, vice-president sales.
Fleet: five Convair 340, eight DC-3.
Results for year ended December 31, 1956: 417,980 passengers; 8,552,252 kg of freight and 264,189 kg of mail carried; 4,003,551 ton-km flown; total costs, £1,838,830; total revenue, £1,901,568; 553 staff.

Hong Kong Airways Ltd. was formed in 1947 to operate feeder services connecting main centres of China with B.O.A.C. trunk route at Hong Kong. A DC-3 service to Shanghai was opened in December 1947 and in 1948 routes were opened to Canton and Manila. Since the Communist conquest of China Hong Kong Airways has been operating only to Formosa with aircraft chartered from Northwest Airlines.

The airline now has two Viscounts and is operating between Hong Kong and Manila, Okinawa and Seoul. In June Viscount services will be inaugurated to Tokyo.

Head Office: Hong Kong.
Executives: H. D. M. Barton, chairman; Maj. R. H. Thornton, director; Hon. D. C. Geddes, director; M. A. Snowball, director.
Fleet: two Viscount 760D, DC-6 and DC-4.
Results for year ended December 31, 1956: 8,359 passengers; 221,737 kg of freight and 21,166 kg of mail carried; 959,916 ton-km flown. Financial details not available. 48 staff.

Hunting-Clan African Airways (Pvt.) Ltd., is an offshoot of Hunting-Clan Air Transport, it operates services within the Federation of Rhodesia and Nyasaland and is described as "The Federation's Independent Airline." Third class passenger and cargo services are operated between Salisbury and Lusaka with compulsory break of journey at Kariba; and between Salisbury and Abercorn *via* Kariba, Lusaka, Ndola and Kasama. Inclusive tour services from Salisbury and Johannesburg to Vilanculos are operated in association with Fishair (Pvt.) Ltd. There is a weekly cargo service between Salisbury and Blantyre and a weekly cargo service between Salisbury and Nairobi as part of Hunting-Clan Air Transport's "Africargo" operation to and from London.

Head Office: Salisbury, Fed. of Rhodesia and Nyasaland.
Fleet: DC-3, D.H.89.

IBERIA—see Compañia Mercantil Anonima IBERIA.

Icelandair—see Flugfélag Islands h.f.

Icelandic Airlines Loftleidir, formed in 1944, has operated services within Iceland and between Iceland and other European destinations, but now confines its activities to the operation of North Atlantic services between New York and Scandinavia, Germany and Luxembourg *via* Iceland.

Fares are substantially below I.A.T.A. rates, although the sectors east of Iceland have I.A.T.A.-agreed fares. Braathens S.A.F.E. Airtransport of Norway works closely with the Icelandic company.

Head Office: Reykjavik, Iceland.
Executives: K. Gudlaugsson, chairman; A. Eliasson, general manager.
Fleet: four DC-4. On order: two Electra (1959/60).
Results for year ended December 31, 1956: 21,773 passengers; 232,896 kg of freight and 32,198 kg of mail carried; 16,888,008 ton-km flown; total costs, £1,109,841; total revenue, £1,217,260; 182 staff.

Illini Airlines, Inc., began operating services in March 1955 between Sterling, Illinois, and Meigs Field in downtown Chicago. Piper Apache aircraft were used and the original frequency was two round-trips on three days a week. Public demand made necessary the purchase of larger aircraft and two Doves were acquired in August and October 1955. The company now serves Detroit, Chicago, Rockford, Freeport and Rock Falls/Sterling with frequent services from Mondays to Fridays.

Head Office: Rockford, Illinois, U.S.A.
Executives: Douglas C. Harvey, president; John W. Bowman, first vice-president; Donald H. Swearingen, chief pilot; Leo Masiulis, passenger sales manager; Scott McCann, cargo sales manager.
Fleet: three Dove. On order: one Heron.
Traffic results not available.

Indian Airlines Corporation was formed in 1953, taking over on August 1 that year the services previously operated by a number of private airlines. Operating 23,600 miles of routes in India and to Afghanistan, Burma, Ceylon, Nepal and East and West Pakistan, the Corporation's operations are divided into three areas with bases at Bombay, Calcutta and Delhi.

I.A.C. is responsible for all Indian internal services but Air-India International flies a few such services as part of its international network. Most of the A.I.I. revenue from internal sectors is passed to Indian Airlines.

Head Office: New Delhi, India.
Executives: S. Prasad, chairman; Y. N. Varma, secretary; J. S. Parakh, financial controller; Capt. J. Chitambar, chief operations and training manager; J. M. Gupta, chief traffic manager.
Fleet: six DC-4, 12 Viking, 65 DC-3, eight Heron. On order: 10 Viscount (from mid-1957).
Results for year ended March 31, 1956: 433,840 passengers; 45,059,000 kg of freight and 5,018,000 kg of mail carried; 33,095,751 ton-miles flown; total costs, £6,960,000; total revenue, £5,978,550; 9,000 staff.

Iranian Airways (Iranair) was founded as a private company in 1944 and began full scale scheduled operations in May 1946. Operations have steadily increased and Iranair's routes now total nearly 9,000 miles and extend across eight Middle East countries. Fifteen cities are served in Iran and the airline flies regular services to Pakistan, Afghanistan, Iraq, Kuwait, Syria and Lebanon. Iranair is managed under contract by Transocean Air Lines and there are plans for routes to Europe, Asia and possibly North America.

Head Office: Teheran, Iran.
Executives: Reza Afshar, chairman and managing director; Allan Barrie, general manager; Walter Kyse, operations manager; Leo Nikkari, controller; George Pohle, general traffic manager; Robert Martin, general sales manager; Ahmad Majidi, commercial manager; Gordon Linscheid, superintendent of maintenance.
Fleet: two Convair 240, seven DC-3, two DC-4, two Dove, four D.H.89, one Beechcraft. On order: three Viscount 700 (1957).
Results for year ended December 31, 1956: 58,598 passengers; 1,077,951 kg of freight and 79,784 kg of mail carried; 4,530,766 ton-km flown; total costs, £743,865 approx.; total revenue, £735,592 approx.; 273 staff.

Iraqi Airways was founded in 1945 as a subsidiary of the Government-owned Iraqi State Railways. B.O.A.C. supplies certain technical staff as required. Viscounts operate frequent services from Baghdad to Basra, Beirut, Damascus, Cairo, and Teheran, and a twice weekly service to London *via* Istanbul and Vienna, and to Athens, Rome and Frankfurt. Vikings will continue to be used on services to Bahrain and Kuwait until improvements are made to Kuwait Airport. Services to Mosul and Aleppo are also flown by Vikings.

Head Office: Baghdad, Iraq.
Executives: Kana'an el Askari, manager; A. D. Bennett, technical adviser; T. M. Walters, flight captain; C. H. Robinson, chief engineer.
Fleet: three Viscount, three Viking, one Dove. On order: one Viscount 773 (October 1957), Viscount 842 (November 1959).
Results for year ended December 31, 1956: 53,684 passengers; 310,864 kg of freight and 50,778 kg of mail carried; 3,264,758 ton-km flown; total costs and total revenue not available; 285 staff.

Japan Air Lines Co., Ltd. (Nihon Koku Kabushiki Kaisha), is successor to the Japan Air Lines which was founded by private interests in 1951. That company opened domestic services with Martin 2-0-2s and DC-4s which, together with crews, were leased from Northwest Airlines. On October 1st, 1953, the new company came into being with the Government holding 50 per cent of the stock. The old J.A.L. routes were taken over and routes were also opened to Hong Kong, Okinawa, Honolulu and San Francisco.

Head Office: Tokyo, Japan.
Executives: S. Yanagita, president; K. Ishikawa, vice-president; S. Matsuo, managing director.
Fleet: five DC-6B, nine DC-4, three Heron, one Beech D.185. On order: four DC-8 (1960), four DC-7C (1957/58).
Results for year ended December 31, 1956: 366,765 passengers; 1,900,743 kg of freight and 1,124,501 kg of mail carried; 43,977,098 ton-km flown; total costs £5,366,446; total revenue, £6,230,782; 1,408 staff. Note revenue figures to year ended September 30, 1956.

One of the two Vickers Viscounts recently delivered to Hong Kong Airways. This aircraft is equipped with long-range slipper fuel tanks, seen outboard of the nacelles.

Jugoslovenski Aerotransport — JAT was founded in 1946 and is now the sole Jugoslav airline; it is completely state-owned. Domestic services are operated as well as routes to Athens, Cairo, Frankfurt, Istanbul, Munich, Paris, Vienna and Zürich.

Head Office: Belgrade, Jugoslavia.
Executives: M. Simovic, general manager; M. Rakic, traffic director; R. Zivanovic, finance director; R. Radojkovic, technical director.
Fleet: 13 DC-3, one Convair 340, one Convair 440. On order: six Il-14.
Results for year ended December 31, 1955: 102,365 passengers; 321 tons of freight and 234 tons of mail carried; 4,640,000 revenue ton-km flown; 419 staff. Financial details not available.

Kar-Air O/Y Karhumäki Airways is the airline operating offshoot of the long-established Finnish aircraft manufacturing, maintenance and charter organization. Scheduled operations were begun in 1950 between Helsinki and Joensuu, using two D.H.89s bought from Finnish Air Lines. In the following year further internal routes were operated as well as one to Sundsvall in Sweden and Lodestars were then used. The company's present routes are from Helsinki to Tampere; Helsinki to Joensuu; and between Tampere and Stockholm.

Head Office: Helsinki, Finland.
Executives: U. Karhumäki, president; M. Palmujoki, traffic manager; T. Karhumäki, technical manager.
Fleet: three DC-3, one Lodestar; on order: one Convair 440 (1957).
Results for year ended December 31, 1956: 23,031 passengers; 17,003 kg of freight and 17,003 kg of mail carried; 531,602 ton-km flown; 65 staff. Financial details not available.

K.L.M.—see Koninklijke Luchtvaart Maatschappij.

K.N.A.—see Korean National Airlines.

Koninklijke Luchtvaart Maatschappij N.V. (K.L.M.), the Dutch national airline, began operations in May 1920. A European network was established, and services to Java began in 1929. Services were begun in the West Indies in 1935 and these continued throughout the war, so the company can claim 37 years of continuous operation.

With a present unduplicated route mileage of about 140,000 miles, K.L.M. has a network of European routes, a West Indies network, and routes between Europe and North, Central and South America; South Africa; the Near, Middle and Far East; and Australia. For more than 30 years K.L.M. was directed by its founder, the late Dr. Albert Plesman. The majority of the company's capital is now held by the Netherlands Government.

Head Office: The Hague, Holland.
Executives: I. A. Aler, president; M. J. van der Ploeg, deputy president; F. Besançon, L. H. Slotemaker, J. van der Wiel, executive vice-presidents.
Fleet: 10 L-749, 18 L-1049, six DC-6, one DC-6A, seven DC-6B, six DC-4, 14 Convair 340, seven Convair 240, 14 DC-3 (three chartered to "De Kroonduif"). On order: 10 DC-7C (1957), nine Viscount 803 (1957), two Fokker Friendship (1959/60), eight DC-8 (1960), 12 Electra (1959/60).
Results for year ended December 31, 1956: 792,000 passengers; 23,091,000 kg of freight and 2,627,000 kg of mail carried; total ton-km flown 234,700,000; total costs, £39,755,639; total revenue, £41,917,293; 16,009 staff.

Korean National Airlines was founded under the Ministry of Transport in 1947, and operated routes radiating from Seoul with Stinson Voyagers. DC-3s were introduced in 1950 shortly before the Korean war stopped commercial operations, which were resumed in 1952. The company now operates DC-3 services within South Korea and a DC-4 service between Seoul and Hong Kong. The company plans to open a Korea - U.S.A. route *via* Honolulu.

Head Office: Seoul, South Korea.
Executives: Y. W. Shinn, president; E. Locker, traffic and sales manager; J. H. Tyler, operations director; M. McCormick, chief engineer.
Fleet: DC-4 and three DC-3.
Traffic statistics not available.

Kuwait Airways, Ltd., was founded in 1953 as Kuwait National Airways, the present name having been adopted in 1955. Services are operated to Bahrein, Abadan, Basra, Jerusalem and Beirut. The company is an associate of B.O.A.C.
Head Office: Kuwait.
Executives: A. S. Alkhalid, chairman; A. R. Mishri, manager; L. C. Giles, resident adviser.
Fleet: two DC-3.
Results for year ended December 31, 1955: 15,809 passengers; 551 tons of freight and 8.5 tons of mail carried; 75 staff. Other figures not available.

Flugfelag Islands, now trading as Icelandair, operates two Douglas DC-4s. "Solfaxi" is seen here approaching Reykjavik. This airline recently purchased two new Vickers Viscounts from the British independent airline Hunting-Clan.

LACSA—see Lineas Aereas Costarricenses, S.A.

LADE—see Lineas Aereas del Estado.

LAI—see Linee Aeree Italiane S.p.A.—LAI.

Lake Air Taxi Service Inc., operates scheduled services between Chicago and Michigan City and Benton Harbour. Passengers and freight are carried and non-routine landings will be made by arrangement at intermediate points or beyond the normal terminals.
Head Office: Chicago, Illinois, U.S.A.
Executive: W. Barnett, president.
Fleet: Piper Apache, Twin Beech.

Lake Central Airlines, Inc., was founded in May 1949 as Turner Airlines to take over and operate the feeder services awarded to, but not implemented by, Roscoe Turner Aeronautical Corporation in 1947. Lake Central began services in November 1949 and works 1,500 miles of routes in the states between and to the south of Lakes Erie and Michigan. In 1955 employees of the airline bought the company's stock.
Head Office: Indianapolis, Indiana, U.S.A.
Executives: Dr. R. B. Stewart, chairman; G. Hicks, president; L. W. Hartman, executive vice-president/treasurer; R. W. Clifford, vice-president-operations; D. S. Getchell, vice-president traffic and sales.
Fleet: 10 DC-3.
Results for year ended December 31, 1956: 135,720 passengers; 1,041,401 kg of express and 200,162 kg of mail carried; 2.080,254 ton-miles flown; total costs, £998,097; total revenue, £981,481; 353 staff.

LANICA—see Lineas Aereas de Nicaragua, S.A.

LAV—see Linea Aeropostal Venezolana.

Leavens Bros., Ltd., which operates passenger services between Leamington and Pelée Island in Lake Erie, a distance of 22 miles, was originally formed in 1927. It was incorporated as Leaven Bros. Air Services in 1935 and was reorganized under its present name in 1953.
Head Office: Toronto, Ontario, Canada.
Executives: C. R. Leavens, president and general manager; R. H. Leavens, vice-president; C. D. Leavens, secretary; R. O. Brown, treasurer.
Fleet: two Cessna Crane.
Results for year ended December 31, 1956: 3,428 passengers; 40,642 kg of freight and 45,722 kg of mail carried; 1,997 ton-miles flown; total costs, £6,000; total revenue, £10,000; two staff.

Lebanese International Airways operates some scheduled services at low frequency between Beirut and Kuwait and also charter flights.
Head Office: Beirut, Lebanon.
Executive: A. Arida, president.
Fleet: two C-46.
30 staff. No other details available.

Leeward Islands Air Transport Co., operates low frequency services connecting Antigua with Montserrat, St. Kitts, Anguilla and San Juan, Puerto Rico.
Head Office: St. John's, Antigua, B.W.I.
Fleet: Piper Apache.
No other details available.

Liberian National Airways is a Government-owned airline which began operations in 1952. Internal services are operated from Robertsfield and Monrovia to eight other points.
Head Office: Robertsfield, Liberia.
Executives: F. H. Syphert, president.
Fleet: three DC-3.

Linea Aerea Nacional — CHILE was founded in 1932 by the Chilean Government to take over Linea Aeropostal Santiago Arica. The original fleet consisted of three Ford Trimotors. The company has developed services throughout the length of Chile and international routes to Mendoza, Buenos Aires and Rio Grande in the Argentine; La Paz in Bolivia; Lima and Tacna in Peru and Montevideo in Uruguay.
Head Office: Santiago, Chile.
Executives: A. Fernandez, president; E. Silva, secretary general; H. M. Sauvageot, business manager; A. Bermudez, technical manager.
Fleet: three DC-6B, three Martin 2-0-2, 16 DC-3, one Electra.
Results for year ended December 31, 1955: 195,376 passengers; 2,324 tons of freight and 114 tons of mail carried; 14,806,000 revenue ton-km flown; total costs, £3,003,428; total revenue, £1,920,985; 1,380 staff.

Linea Aerea TACA de Venezuela, C.A., Founded in 1944 by TACA Airways S.A. and Venezuelan interests. Local services were opened in 1945 and in 1950 TACA Airways disposed of its interest in the company. Two years later L.A.V. acquired outstanding stock

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and the airline is now a wholly owned L.A.V. subsidiary operated as a separate division. Services operated are all domestic with the exception of the routes from Caracas and Maracaibo to Bogota in Colombia.

Head Office: Caracas, Venezuela.
Executives: Col. L. Calderon, president; L. Paúl, general manager.
Fleet: 13 DC-3.
Results for year ended December 31, 1955: 152,481 passengers; 2,509 tons of freight and mail carried; 517,109 ton-miles flown; 300 staff. Financial details of operating results not available.

Linea Aeropostal Venezolana—LAV, was founded in 1933 when the Venezuelan Government took over the routes and equipment of the Cie. Gle. Aéropostale which had begun operating in Venezuela in 1930. LAV began flying with Latécoère 28 monoplanes and the first new type to be introduced was the Electra. LAV, which took over TACA de Venezuela in 1952, now has more than 16,000 miles of routes in Madrid, Miami, New York, Panama, Rome and Trinidad.

Head Office: Caracas, Venezuela.
Executive: Col. L. Calderon, president.
Fleet: three Viscount, one L-1049G, one L-1049C, three Constellation, 18 DC-3, two Martin 2-0-2, C-46.
Results for year ended December 31, 1954: 222,554 passengers; 4,481,000 freight ton-km and 668,000 mail ton-km flown; total ton-km 18,875,000; 1,811 staff. Financial details not available.

Lineas Aereas Costarricenses S.A. "LACSA," was founded in 1945 by Pan American Airways, the Government of Costa Rica and Costa Rican private interests. P.A.A. originally held 36 per cent of the stock but is believed now to hold a smaller percentage. Scheduled operations began in 1946. In 1952 LACSA took over TACA de Costa Rica, which had operated since 1939 as one of the units of the TACA system. LACSA operates a network of internal services based on San José and also routes to Panama, Puerto Rico, El Salvador, Mexico, Cayman Islands, Cuba and Miami.

Head Office: San José, Costa Rica.
Executives: F. Terán, president; R. E. Smith, general manager; F. Bonilla, asst. general manager; C. Holst, operations manager and chief pilot.
Fleet: three DC-3, four Curtiss C-46, two Convair 340.
Results for year ended December 31, 1955: 106,216 passengers; 8,379 tons of freight and 180 tons of mail carried; 4,350,628 ton-miles flown; total costs, £871,105; total revenue, £955,485; 348 staff.

Lineas Aereas de Nicaragua, S.A.—LANICA, was founded in June 1945 with Pan American Airways holding 40 per cent of the company's capital. Internal services were begun in 1946 with a fleet consisting of two Boeing 247 aircraft. At present the company serves nine points in Nicaragua in addition to its home city, Managua.

Head Office: Managua, Nicaragua.
Executives: Col. L. A. Somoza, president; A. Sacasa, vice-president; F. P. Powers, vice-president; F. Gaitán, treasurer; C. A. Tellería, secretary.
Fleet: six DC-3, one C-46, Ryan Navion.
Results for year ended December 31, 1955: 21,852 passengers; 14,459 tons of freight and 48 tons of mail carried; 1,426,811 ton-miles flown; total costs, £271,095; total revenue, £297,636; 189 staff.

Lineas Aereas del Estado—LADE, was founded in September 1940 as a branch of the Argentine Air Force to operate services to isolated areas, and which could not be worked as commercial undertakings. After the war these services were taken over by commercial airlines but LADE is again flying certain domestic services.

Head Office: Buenos Aires, Argentina.
Executives: Names not available.
Fleet: Viking, DC-3, DC-4.
Traffic statistics not available.

Linee Aeree Italiane, S.p.A.—LAI, was formed in 1946 with Italian interests holding 60 per cent of the stock and T.W.A. 40 per cent. The first routes, from Rome to Milan, Palermo and Cagliari, were opened in April 1947. In 1952 LAI absorbed Ali Flotte Riunite thus reducing the number of post-war Italian airlines to two. Transatlantic services were inaugurated in July 1950. LAI's present system includes domestic and European operations and routes to Boston, New York, Tel Aviv, and Teheran.

Head Office: Rome, Italy.
Executives: in process of re-organization.
Fleet: two DC-6B, three DC-6, four Convair 240, 13 DC-3. On order: 10 Viscount 785, four L-1649A.
Results for year ended December 31, 1955: 227,249 passengers; 3,159,000 freight ton-km and 1,503,000 mail ton-km flown; total ton-km 23,110,000; 1,257 staff. Financial details not available.

Lloyd Aéro Boliviano S.A., was founded by German colonists on September 14, 1925, and opened in that year a route between Cochabamba and Santa Cruz. Junkers F13s were used on these first services. The company was taken over as the Bolivian national airline in 1941 and Panagra was given a contract to administer the airline. The government of Bolivia now holds 50 per cent of the stock of L.A.B.

The airline operates a network of domestic services and also routes to Arica in Chile, and Salta, Argentina.

Head Office: Cochabamba, Bolivia.

A new picture from Egypt of one of Misrair's fleet of three hard-working Viscount 739s.

Executives: Edmundo Gonzalez G, president; Rodolfo Galindo Q, general manager.
Fleet: 11 DC-3, two DC-4, six Boeing B-17.
Results for year ended December 31, 1956: 171,243 passengers; 23,587,362 kg of freight and 49,812 kg of mail carried; 14,410,577 ton-km flown; total costs (to November), £2,974,577; total revenue (to November), £410,669; 1,496 staff.

Lloyd Aereo Colombiano is a fairly new company and no details of its operations are available.

Head Office: Bogota, Colombia.
Fleet: C-46, DC-3, Cessna 310. On order: three Viscount 770.

Loftleidir—see Icelandic Airlines.

Loide Aéreo Nacional S.A., was established in its present form in 1951 by amalgamation with Linhas Aereas Paulistas and Transportes Aereos Bandeirantes. Nearly 10,000 miles of route are operated within Brazil, many second-class services being flown.

Head Office: Rio de Janeiro, Brazil.
Executives: General J. M. Lima, president; Col. M. G. Jacques, general and operations manager.
Fleet: 21 Curtiss C-46.
Results for year ended December 31, 1955: 94,399 passengers; 6,195 tons of freight and 159 tons of mail carried; 7,919,972 ton-km flown; total costs, £3,963,844; total revenue, £4,496,687; more than 700 staff.

Los Angeles Airways, Inc., was incorporated on May 11th, 1944. The company began a mail service circuit in the San Fernando Valley on October 1st, 1947, and thereby became the first helicopter-scheduled service operator. Two further circuits were opened, one on October 15th and the other on January 8th, 1948. A shuttle service was also established between the Los Angeles post office roof and the International Airport. Passenger services were inaugurated in November 1954 and these services now link 11 points with Los Angeles International Airport—S-55s are used on these services and the S-51s operate the mail flights. Route mileage 296.

Head Office: Los Angeles, Cal., U.S.A.
Executives: C. M. Belinn, president; M. J. Burke, secretary; J. T. Kane, treasurer; R. L. Bromberger, flight operations manager.
Fleet: five S-55, two S-51.
Results for year ended December 31, 1956: 43,205 passengers; 109,757 revenue ton-miles flown. Other details not available.

Lufthansa—see Deutsche Lufthansa A.G.

Mackey Airlines, Inc., now operating scheduled passenger services from St. Petersburg, Miami, Tampa, Fort Lauderdale and West Palm Beach to Nassau in the Bahamas, was incorporated as Mackey Air Transport in 1946. Scheduled operations were approved in 1952 and inaugurated on January 2nd, 1953. Applications have been filed for routes to Havana and other places in the Caribbean area.

Head Office: Fort Lauderdale, Florida, U.S.A.
Executives: J. C. Mackey, president; L. J. Povey, vice-president; J. H. Popham, secretary; H. H. Johnson, traffic manager.
Fleet: four DC-3, two DC-4, two Goose. On order: two Fokker Friendship (October and November 1957).
Results for year ended December 31, 1955: 32,683 passengers; 40 tons of freight carried; 889,029 ton-miles flown; 62 staff. Figures are for scheduled operations only. Financial details not available.

MacRobertson Miller Airlines, Ltd., was brought into being in 1955 by the merger of MacRobertson-Miller Aviation Co. (Pty.), Ltd., and Airlines (W.A.), Ltd. MacRobertson-Miller Aviation was founded in 1927 and was successor to the Commercial Aviation Co., founded by Capt. H. C. Miller shortly after the first war. Airlines (W.A.) was established in 1935 and the two companies had extensive experience in the operation of airlines throughout the length of the west coast of Australia and the allied inland districts. It is over this entire area that the new company is now operating scheduled services.

Head Office: Perth, Western Australia.
Executives: C. N. Kleinig, managing director; H. C. Miller, regional director; J. W. Cameron,

executive director; E. C. Gare, secretary; K. Cohen, operations manager.
Fleet: five DC-3, three Dove, three Anson.
Results for year ended December 31, 1956: 46,556 passengers; 1,678,300 kg of freight and 908,994 kg of mail carried; 391 staff. Other details not available.

Magyar Légiközlekedési Vállalat—MALEV was founded as Maszovlet (Hungarian - Soviet Air Traffic Company) in 1946. The U.S.S.R. withdrew its interest in 1954 and the present title was then adopted. The airline now operates domestic services and to Sofia, Berlin, Warsaw, Budapest, Prague, Bucharest, Vienna and Belgrade.
Head Office: Budapest, Hungary.
Fleet: Li-2.

Malayan Airways, Ltd., founded in 1947, has as its main shareholders Blue Funnel Line, Straits Steamship Co., and B.O.A.C. (with a minority interest). DC-3s operate from Singapore to points in Malaya and to Medan, Palembang, Bangkok, Sarawak and North Borneo. North Borneo - Brunei - Sarawak local services are operated with D.H.89s.
Head Office: Singapore.
Executives: F. L. Lane, chairman; R. P. Mollard, managing director; J. Skeldon, manager; A. G. Beohm, traffic manager; S. H. Edwards, engineer superintendent.
Fleet: 11 DC-3, three D.H.89.
Results for year ended December 31, 1956: 156,580 passengers; 3,856,636 kg of freight and 595,093 kg of mail carried; 4,077,384 ton-miles flown; 856 staff. Financial details not available.

MALEV—see Magyar Légiközlekedési Vállalat.

Malta Airlines, The. This concern is an associate of B.E.A. and consists of the Malta Airways Company, Ltd., and its wholly owned subsidiary Air Malta, Ltd. B.E.A. operates the routes of The Malta Airlines and these are between Malta and Italy, France, the United Kingdom, Corsica and Libya. The B.E.A. shareholding is 34 per cent.
Head Office: Valetta, Malta G.C.
Executive: Lt-Col. R. Strickland, chairman.
Fleet: B.E.A. aircraft supplied and operated by agreement.

Mandated Airlines, Ltd., was founded in 1936 as a subsidiary of W. R. Carpenter and Co., Ltd., the aviation assets of which were taken over by Qantas in 1934. Mandated became an independent company, and in 1937 the airline was awarded a contract for passenger, mail and cargo work in New Guinea. Mandated now operates scheduled services from Lae to eight points including Goroka, Wau, Port Moresby and Rabaul. Charter and other work is also undertaken.
Head Office: Lae, New Guinea.
Executives: J. B. Sedgers, managing director; C. Bailey, A. Anthony, G. Washington, J. I. Cromie, directors; H. J. Hindwood, manager.
Fleet: two DC-3, three D.H.84. On order: one DC-3.
Results for year ended March 31, 1956: 27,683 passengers; 2,986,977 kg of freight and 109,385 kg of mail carried. Other details not available.

Maritime Central Airways, Ltd., is a private company which began regular service in 1941 between Charlottetown on Prince Edward Island and Moncton, New Brunswick. With its mixed fleet the company undertakes charter work and maintains regular services to New Glasgow, Halifax, the Magdalen Isles, Summerside, Moncton, St. John, Fredericton, Goose Bay, Gander and St. John.
Head Office: Charlottetown, Prince Edward Island, Canada.
Executives: J. K. Curran, president; F. T. Briggs, vice-president; C. F. Burke, managing director; A. M. Clark, secretary/treasurer; H. S. Jones, operations manager.
Fleet: eight DC-3, four DC-4, three C-46, one York, one Beaver, three Beech C-185. On order: two DC-6B.
Results for year ended December 31, 1956: 33,779 passengers; 348,676 kg of freight and 376,663 kg of mail carried; total costs, £2,841,245; total revenue, £3,586,126; 462 staff.

Matane Air Services, Ltd., was founded in 1947 to operate charter services across the St. Lawrence from Matane. In 1952 regular services were opened from Matane to Franquelin Godbout, Trinity Bay, Pentecote and Shelter Bay. Since early 1957 the company has been the only carrier serving these points. The company has recently been licensed to operate between Matane and Baie Comeau, and Matane and Lac Ste. Anne.
Head Office: Matane, Quebec, Canada.
Executives: E. Burnett, president; G. Burnett, managing director; J. G. Sirois, chief engineer; W. J. Anderson, chief pilot.
Fleet: four Lockheed 10A Electra, two Cessna Crane.
Results for year ended December 31, 1956: 14,561 passengers; 55,701 kg of freight carried; 3,620 ton-miles flown; 14 full time and six part time staff. Financial details not available.

I-LIFE, first of ten Viscount Series 785 aircraft ordered by Linee Aeree Italiane.

Mercury International Company Airlines, was operating local services between San Bernardino and Los Angeles, Riverside, Big Bear Lake and Victorville. There is no recent news of this company.
Head Office: San Bernardino, Cal., U.S.A.
Fleet: Cessna 195, Beech Bonanza.

Middle East Airlines Co. S.A.—MEA, was founded as a private concern in 1945. In 1949 Pan American Airways acquired 36 per cent of MEA's stock but the company has now withdrawn and B.O.A.C., through A.B.A.M.E.L., holds 48 per cent of the stock. Services are operated throughout the Middle East and to Ankara, Athens, Istanbul, Rome, Vienna, Paris, Frankfurt and London.
Head Office: Beirut, Lebanon.
Executives: Sheikh Najib Alamuddin, chairman/managing director; Col. Cyril Essely, general manager; E. C. Terleske, financial comptroller; Salim Salaam, asst. G.M. sales; Assad Y. Nasr, asst. G.M. planning and administration; Capt. R. Hornall, asst. G.M. operations.
Fleet: three Viscount 732, four DC-3, one Bristol 170. On order: two Viscount 732 (1957, per B.O.A.C.).
Results for year ended December 31, 1956: 57,000 passengers; 587,000 kg of freight and 70,000 kg of mail carried; 6,812,000 ton-km flown; 470 staff. Financial details not available.

Minhaiduy, Civil Aviation Administration of China, is successor to Skoga, which was formed in 1952 as a joint Soviet-Chinese undertaking. In 1954 Soviet participation was withdrawn. Minhaiduy now operates a large domestic network and international services to Irkutsk (as part of the Peking-Moscow route), Rangoon, and Hanoi.
Head Office: Peking, China.
Fleet: Il-14, Il-12, Li-2.

Misrair S.A.E. — Egyptian Airlines was founded as Misr Airwork in 1932. The present name was taken in 1949 and all the capital is now Egyptian-owned. Scheduled services were begun in 1933 and the company now operates an extensive network of services in the Middle East and to Europe.
Head Office: Cairo, Egypt.
Executives: Air Commodore M. S. El Miligi, general manager; A. O. Mokbel, deputy general manager (administration); M. F. Raafat, deputy general manager (commercial); H. Tewfik, deputy general manager (technical).
Fleet: three Viscount 700, seven Viking, one Beech D.18S.
Results for year ended December 31, 1956: 84,877 passengers; 1,467,042 kg of freight and 70,034 kg of mail carried; 6,489,765 ton-km flown; 1,348 staff. Financial details not available.

Mohawk Airlines, Inc., was founded in 1945 as an intra-state carrier with the title Robinson Airlines. The company took its present name in 1952 and is now operating about 1,500 miles of routes in New York, New Jersey, New England, Pennsylvania and Michigan. During 1954 Mohawk operated helicopter services between Newark and Liberty/Monticello. An S-55 was used but this venture was short-lived.
Head Office: Oneida County Airport, Utica, N.Y., U.S.A.
Executives: E. Victor Underwood, chairman; R. E. Peach, president; J. R. Carver, vice-president/secretary; C. A. Benscoter, vice-president operations; W. D. Bosworth, treasurer.
Fleet: 11 DC-3, 11 Convair 240.
Results for year ended December 31, 1956: 353,754 passengers; 622,800 kg of freight and 971,962 kg of mail carried; 6,469,684 ton-miles flown; total costs, £2,100,023; total revenue, £2,046,410; 596 staff.

NAB—see Navegaçao Aerea Brasileira.

National Airlines, Inc., known as *Airline of the Stars* was founded as National Airlines System in October 1934 as a regional operator with a 142 mile route between St. Petersburg and Daytona Beach. The airline now operates a network extending from New York and Washington down the eastern seaboard to Tampa and Miami. Routes from Jacksonville and Tampa stretch west to New Orleans, and Havana is served by routes from New York, Tampa and Miami. Throughplane services link New Orleans with California.
Head Office: Miami, Florida, U.S.A.
Executives: G. T. Baker, president; J. C. Brawner, vice-president/treasurer; R. P. Foreman, secretary; L. W. Dymond, asst. vice-president operations; W. A Perry, vice-president/general sales manager; H. K. Pike, asst. vice-president maintenance and engineering.
Fleet: 10 Lodestar, 12 Convair 340, four DC-6, eight DC-6B, four DC-7, six Convair 440, four DC-7B (in course of delivery). On order: two L.1049H, 23 Electra (1959-60), six DC-8 (1959-60).
Results for year ended December 31, 1956: 1,466,457 passengers; 112,866,214 revenue ton-miles flown.

National Greek Airlines, T.A.E. was founded in July 1951 by the amalgamation of T.A.E., Hellenic Airlines and the smaller A.M.E. Following financial difficulties the company was taken over by the Greek Government in June 1955 and in the near future its operations will be taken over by a new company, Olympic Airways, recently formed by Mr. A. Onassis. T.A.E. operates domestic services and to Turkey, Cyprus, Israel, Egypt, Lebanon, Italy, France and the United Kingdom.
Head Office: Athens, Greece.
Executives: A.V-M. N. Voyadzis, president; S. Damaskinos, commercial manager; J. Papaletsos, financial manager; C. Dannis, technical manager; G. Theodoropoulos, planning manager.
Fleet: one DC-4, 14 DC-3, one Fairchild Argus.
Results for year ended December 31, 1956: 179,888 passengers; 2,531,678 kg of freight and 233,713 kg of mail carried; 6,916,694 ton-km flown; 850 staff. Financial details not available.

New York Airways were the first airline to introduce the Sikorsky S-58. This type flies on the company's services linking the New York airports.

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Navegacao Aerea Brasileira, N.A.B., was established in 1939 and began operations in 1941 over a coastal route linking Rio de Janeiro and Fortaleza. In 1948, when the route mileage had reached nearly 5,000, financial difficulties caused the suspension of operations. The company began work again in 1951 and at present NAB serves a coastal route from Rio to Vitoria, and an inland route to Belo Horizonte.

Head Office: Rio de Janeiro, Brazil.
Executives: Cmdr. G. X. de Oliveira, general manager.
Fleet: DC-3.
Traffic statistics not available.

Nederlands Nieuw Guinea Luchtvaartmaatschappij "De Kroonduif" N.V., is a new company operating local services based on Biak. "De Kroonduif" is managed by K.L.M. from which company its DC-3s are chartered. This airline was the first to confirm an order for Scottish Aviation Twin Pioneers.

Head Office: The Hague, Holland.
Executives: managed by K.L.M.
Fleet: three DC-3 (chartered from K.L.M.), four Beaver. On order: three Twin Pioneer (1957).
Results for year ended December 31, 1956: 17,100 passengers; 358,100 kg of freight and 74,800 kg of mail carried; total ton-km flown 823,000; 148 staff. Financial details not available.

New York Airways, Inc., was formed in 1949 with the object of operating scheduled helicopter services in the New York area. Mail operations between the New York airports were inaugurated on October 15, 1952. Mail services were subsequently opened to suburban areas, and passenger services linking New York International, La Guardia and Newark airports began on July 8, 1953. In addition to its airport links the company now serves the New York area, New Jersey and Connecticut. Regular service to and from Manhattan began on December 5, 1956.

Head Office: La Guardia Airport, New York.
Executives: R. L. Cummings, Jnr., president; H. Brock, vice-president; W. W. Hogan, treasurer; John H. Slate, secretary.
Fleet: three Sikorsky S-58, five S-55, one Bell 47H.
Results for year ended December 31, 1956: 42,971 passengers; 1,140,031 kg of freight and 526,081 kg of mail carried; 109,757 ton-miles flown; financial details not available; 186 staff.

New Zealand National Airways Corporation —NAC. This company was founded by Act of Parliament in 1945 to take over and expand the operations of Air Travel (N.Z.), Ltd., Cook Strait Airways, Ltd., and Union Airways of New Zealand, Ltd. Following the change of Government in 1949 an attempt was made to sell NAC but this was not successful. NAC operates over 3,679 miles of routes in and between North and South Islands.

Head Office: Wellington, C.I., New Zealand.
Executives: Sir Leonard Isitt, chairman; J. S. Hunter, deputy chairman; J. J. Busch, general manager; H. C. Walker, operations manager; W. J. Jennings, commercial manager; C. W. Labette, engineering superintendent.
Fleet: 25 DC-3, four Heron, three D.H.89. On order: three Viscount 807.
Results for year ended December 31, 1956: 469,616 passengers; 8,205,599 kg of freight and 548,220 kg of mail carried; 17,168,896 ton-miles flown; 1,416 staff. Financial details not available.

North Central Airlines, Inc., was founded in 1944 as Wisconsin Central Airlines. Approval for the operations of routes from Chicago to cities in Wisconsin, eastern Minnesota and Upper Michigan was given in 1946 and operations were begun with Lockheed Electras in February 1948. The company adopted its present name at the end of 1952, now operates 3,241 miles of routes in the Great Lakes area, serving 51 cities in nine States. NCA may acquire Lake Central Airlines adding 28 cities and 1,986 route miles to its system.

Head Office: Minneapolis, Minnesota, U.S.A.
Executives: H. N. Carr, president; B. Sweet, secretary/treasurer; F. N. Buttomer, vice-president traffic and sales; A. D. Niemeyer, vice-president operations; R. H. Benido, vice-president maintenance and engineering; A. E. Schwandt, vice-president industrial relations.
Fleet: 25 DC-3.
Results for year ended December 31, 1956: 546,654 passengers; 2,249,781 kg of express and 1,250,039 kg of mail carried; total costs, £2,807,075; total revenue, £2,846,068; 987 staff.

Northeast Airlines now serves the New England area and has routes extending from Montreal through Boston, New York, and Washington to Florida. The company was founded by the Boston and Maine and Maine Central Railroads as Boston-Maine Airways, and services were begun between Boston and Waterville on August 11, 1933. The present name was taken in 1940.

Head Office: Boston, Mass., U.S.A.
Executives: George E. Gardner, president; D. W. H. MacKinnon, vice-pres. engineering and maintenance; A. A. Lane, vice-pres. operations; H. Heard, treasurer; R. H. Kerr, vice-pres. personnel; Ann Wood, special asst. to president; E. Breed, director of sales; C. H. McKenney, director of traffic.
Fleet: 12 DC-3, six Convair 240, one C-46, 10 DC-6B in course of delivery. On order: five Britannia (October-November 1957).
Results for year ended December 31, 1956: 592,967 passengers; 1,506,000 kg of freight, 1,015,000 kg of express and 671,000 kg of mail carried; 11,576,066 ton-miles flown; total costs, £3,831,639; total revenue, £3,678,640; 1,167 staff.

Northern Consolidated Airlines, Inc., was founded in 1945 to integrate the operations of a number of small airlines in southwest Alaska. The company now has about 3,000 miles of routes worked by scheduled and non-scheduled flights.

Head Office: Anchorage, Alaska.
Executives: R. I. Petersen, president/general manager; S. B. Fitzhugh, vice-president/treasurer; V. R. Davis, secretary/general traffic manager; W. R. Rice, operations manager; L. P. Fritz, general sales manager.
Fleet: four DC-3, 11 Cessna T-50. On order: three Friendship (1958/59).
Results for year ended December 31, 1956: 18,984 passengers; 2,071,137 kg of freight and 802,850 kg of mail carried; 1,651,388 ton-miles flown; total costs, £1,074,162; total revenue, £1,153,215; 165 staff.

Northern Wings, Ltd.—Les Ailes du Nord Ltée, flies non-scheduled services and is believed to operate a scheduled route of about 400 miles from Seven Islands to Blanc Sablon on the Quebec/Labrador border.

Head Office: Quebec, P.Q., Canada.
Executives: Dr. G. Cyr, president; Me. H. Beaupré, secretary; J. L. Roy, controller; T. Coghlan, general manager.
Fleet: two DC-3, two Canso, two Norseman, two Beaver, one Beech 17, one Anson V.

Northwest Airlines, Inc., was incorporated on August 1, 1926, as Northwest Airways and mail services were begun between Minneapolis/St. Paul and Chicago on October 1 that year, using a leased Curtiss Oriole and a Thomas Morse. The company's first owned fleet consisted of three Stinson Detroiters purchased in 1926 and the first passenger services were opened in July 1927.

The present corporate name was adopted in 1934. For publicity purposes the airline trades as Northwest Orient Airlines. By 1945 a transcontinental route had been established and in 1947 the company began services to the Far East. In 1948 Washington and Honolulu were added to the network and in 1950 Edmonton and Formosa were added. The present system comprises 20,000 miles of routes stretching from coast to coast of the U.S.A.; into Canada and Alaska; to Hawaii; and across the Pacific to Japan, South Korea, Okinawa, Manila, Formosa and Hong Kong.

Head Office: St. Paul, Minnesota, U.S.A.
Executives: C. Hunter, chairman; D. W. Nyrop, president; M. S. Mackay, executive vice-president; F. C. Judd, vice-president operations and engineering; G. M. Bain, vice-president sales; L. S. Holstad, comptroller; W. J. Eiden, treasurer.
Fleet: three DC-7C, four L.1049G, nine Stratocruiser, 14 DC-6B, 18 DC-4, six DC-3. On order: six DC-6B (1957-58), 11 DC-7C (1957/58). An order for 707s or DC-8s is forthcoming.
Results for year ended December 31, 1956: 1,427,063 passengers; 27,485,130 freight and 24,497,831 mail ton-km flown, total ton-km flown, 211,897,302; total costs, £25,099,728; total revenue, £27,383,292; 5,573 staff.

Olympic Airways—see National Greek Airlines, T.A.E.

Ostermans Aero A.B., was formed in 1943 and has since 1947 been operating helicopters. Most of the company's work is of a contract nature but every winter since 1948 Ostermans have operated regular mail service between Stockholm and numerous points in the Stockholm Archipelago. This service has been operated with very high standards of reliability and regularity. During 1955 the company operated S-55 services, for a short time, between Sweden and Denmark.

Head Office: Stockholm, Sweden.
Executive: N. Billing, managing president.
Fleet: two S-55, 10 Bell 47, one Djinn 1220, three Seabee, one Norseman.

Österreichische Luftverkehrs A.G., (Austrian Airlines), is the new Austrian airline founded in April 1956 by agreement between Air Austria and Austrian Airways, neither of which had begun operations. The capital of the new company is reported as £3,000.000. Scandinavian Airlines System and Fred Olsen Airtransport each have 15 per cent interests in the new company which is expected to begin European operations on June 1.

Head Office: Vienna, Austria.
Fleet: Initial operations are expected to be with Fred Olsen Airtransport Viscounts.

Ozark Air Lines, Inc., was incorporated under the laws of the State of Missouri on September 1, 1943, and filed applications for C.A.B. certificate to serve 28 cities in six states. Charter and intra-state services in Missouri operated during 1944 and 1945. Ozark was awarded a three-year certificate in 1950, took

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over the assets and staff of Parks Air Lines and began scheduled operations between St. Louis and Chicago; the first of these was flown on September 26, 1950.

The company now has permanent certification and operates 4,906 miles of routes serving 49 cities in nine Mid-West states.

Head Office: St. Louis, Missouri, U.S.A.
Executives: B. T. Mattingly, chairman; L. Hamilton, president; A. Blumeyer, vice-president; F. W. Jones, treasurer; A. G. Heyne, secretary.
Fleet: 20 DC-3.
Results for year ended December 31, 1956: 317,197 passengers; 80,465 freight and 115,452 mail ton-miles flown; total ton-miles flown 4,932,283; total costs, £2,100,417; total revenue, £2,061,917; 693 staff.

Pacific Northern Airlines, Inc., calls itself "The Alaska Flag Line" and came into being in 1932 as Woodley Airways. A post office mail contract was awarded in 1934 and in 1938 the airline received C.A.B. certification. The present company was incorporated in 1945 and in 1951 P.N.A. was granted a certificate by C.A.B. to connect its Alaskan routes with Seattle - Tacoma and Portland. Services are now operated within Alaska and between Alaskan points and Seattle and Portland.

Head Office: Seattle, Washington, U.S.A.
Executives: A. G. Woodley, president: J. A. Cunningham, vice-president operations; Harold A. Olsen, vice-president traffic and sales; J. H. Foster, vice-president engineering and maintenance.
Fleet: three L.749 Constellation, two DC-4, four DC-3.
Results for year ended December 31, 1956: 117,032 passengers; 3,364,354 freight and 904,124 mail ton-miles flown; total costs, approx. £3,303,000; total revenue, approx. £3,570,000; 500 staff.

Pacific Southwest Airlines—PSA, operates services linking San Diego, Los Angeles and San Francisco.

Head Office: San Diego, Cal., U.S.A.
Executives: K. G. Friedkin, president; H. N. Wood, traffic and sales manager; J. F. Andrews, chief of operations.
Fleet: DC-4.

Pacific Western Airlines, Ltd.—PWA, was founded in 1946 as Central British Columbia Airways, and has become the third largest airline in Canada. The company operates an extensive network of scheduled and non-scheduled routes throughout British Columbia, Alberta, the Yukon, the Northwest Territories and Alaska. PWA has also been one of the prime contractors operating the extensive air lift in connection with defence projects in Canada's extreme north.

Head Office: Vancouver, B.C., Canada.
Executives: K. J. Springer, chairman; R. Baker, president; D. F. Granger, secretary/treasurer.
Fleet: includes DC-3, C-46, Canso, Anson 5, Norseman. Stranraer, Beaver, Stinson 108, Junkers-W34, Mallard, Cessna 180, Fairchild 71.
Results for year ended December 31, 1956: 101,444 passengers; 284,940 kg of freight and 68,053 kg of mail carried; 110,767 ton-km flown; 615 staff. Financial statistics not available.

Pakistan International Airlines Corporation was founded by the Government of Pakistan on April 1st, 1955, when P.I.A. took over Orient Airways. As a company P.I.A. had been founded in 1951 to operate services to Europe; its first actual operations were between East and West Pakistan in 1954. Service to London was begun early in 1955. The Corporation is now responsible for the operation of all Pakistani air services.

Head Office: Karachi, Pakistan.
Executives: Z. Ahsan, general manager; M. M. Salim, executive asst. to general manager; N. G. Hemsworth, flight operations manager; E. Jamall, engineering manager; J. S. Mirza, traffic and sales manager.
Fleet: three L.1049C, four Convair 240, ten DC-3. On order: three Viscount 815.
Results for year ended December 31, 1955: 84,508 passengers; 3,067 tons of freight and 2,061 tons of mail carried; 11,075,000 ton-km flown; 2,108 staff. Financial details not available.

Philippine Air Lines use a number of de Havilland Otters on local services.

Panagra—see Pan American-Grace Airways, Inc.

Panair do Brasil, S.A. In October 1929 the Brazilian Government authorized New York, Rio and Buenos Aires Line Inc. (NYRBA) to operate services in Brazil, and Nyrba do Brasil was created as a Bazilian subsidiary. A service was begun between Rio de Janeiro and Belem. In August 1930 Pan American Airways took over both NYRBA and Nyrba do Brasil and the latter became Panair do Brasil on September 15th that year. PAB developed services with Sikorsky S-38 and Consolidated Commodore flying-boats. These were later replaced by Fairchild 91s and Sikorsky S-43s and, although Panair now operates an extensive Brazilan and South American route network with DC-3s and Constellations, Catalinas still operate the Amazon routes. Panair operates services from South America to London, Hamburg, Frankfurt, Düsseldorf, Paris, Zürich, Rome, Madrid, Lisbon, Istanbul and Beirut.
Head Office: Rio de Janeiro, Brazil.
Executives: Dr. A. H. Machado, president; Dr. C. P. de Mello, dir. superintendent; Dr. A. T. Filho, secretary.
Fleet: 10 Constellation, 14 DC-3, four DC-7C, four Convair PBY-5A.
Results for year ended December 31, 1956: 335,867 passengers; 5,056,155 kg of freight and 469,551 kg of mail carried; 88,857,786 ton-km flown; total costs, £7,617,704; total revenue, £8,158,737; 4,313 staff.

Pan American-Grace Airways, Inc., (Panagra), was founded in 1929 by the Grace Shipping Line and Pan American Airways, each holding half the shares. In 1928 Pan American Airways was awarded a mail contract for a service from Florida to Panama, and in the following year Panagra successfully bid for a mail contract covering a route from Panama down the west coast of South America and across the Andes to Buenos Aires. By the end of 1929 the complete route was in operation. The company's routes have been gradually extended and after a long fight, much of it against Pan American, Panagra has succeeded in securing entry to New York through interchange agreements with P.A.A. and National Airlines. Operating over the routes of the three companies Panagra DC-7Bs were introduced on August 1, 1955, and under the title of El Inter Americano daily services are flown between New York and Buenos Aires. It was recently stated that PanAm is to sell its Panagra interests.

Head Office: New York, U.S.A.
Executives: A. B. Shea, president; D. Campbell, vice-pres./gen. mgr.; L. H. Clifton, vice-president/comptroller; C. S. Collins, vice-president traffic and sales.
Fleet: four DC-3, three DC-4, four DC-6 (leased out), four DC-6B owned, one DC-6B leased, five DC-7B. On order: one DC-7B, four DC-8.
Results for year ended December 31, 1956: 141,200 passengers; 3,568,000 kg of freight and 582,000 kg of mail carried; 22,801,925 ton-miles flown; 1,401 staff. Financial details not available.

Pan American World Airways, Inc., is the only major U.S. airline concerned entirely with overseas operation. Pan American Airways, Inc., was founded in March 1927 and began operation of its first route, between Key West and Havana, in October 1927. Fokker monoplanes were used. P.A.A. extended its operation throughout the Caribbean and built up flying-boat services, which by 1931 had reached the Argentine. P.A.A. was a great pioneer of transocean flying and by 1935 had established services between San Francisco and Manila *via* Honolulu, Midway, Wake and Guam. Hong Kong was served from 1936. In 1937 New York-Bermuda services were opened in co-operation with Imperial Airways and in the same year the two companies began trans-atlantic survey flights. Passenger service began in 1939. The airline now operates a route network of more than 60,000 miles, serves all continents and has regular round the world flights. Pan American took its present title in 1949. The airline has absorbed a number of other airlines including American Overseas Airlines and it has interests in numerous carriers, particularly in Latin America. P.A.A. has been a particularly strong advocate of cheap fares and mass air travel. Pan American is also operating the 1,000 mile long missile range, stretching from Florida to beyond Puerto Rico, for the U.S.A.F.

Head Office: New York, U.S.A.
Executives: J. T. Trippe, president; J. C. Leslie, vice-president administration; S. F. Pryor, vice-president/asst. to president; H. J. Friendly, vice-president/general counsel; W. L. Morrison, vice-president Latin American Division; H. E. Gray, vice-president Atlantic Division; C. M. Young, vice-president Pacific-Alaska Division.
Fleet: 25 Stratocruiser, 33 DC-7C (in course of delivery), seven DC-7B, 44 DC-6B, three DC-6A, 26 DC-4, five L.49, five Convair 240, three DC-3. On order: 25 DC-8 (start 1959), six Boeing 707-120 (start 1958), 17 Boeing 707-320 (start 1958). Four DC-6 leased from Panagra.
Results for year ended December 31, 1955: 2,200,000 passengers; 75,600,000 freight ton-miles and 34,700,000 mail ton-miles flown; total costs, £80,492,850; total revenue, £85,035,710; 19,262 staff.

Peninsula Air Transport is a U.S. supplemental air carrier operating scheduled services on an irregular basis from Miami to St. Petersburg, Philadelphia, New York, Chicago, Detroit and Milwaukee.

Head Office: Miami, Florida, U.S.A.
No other details available.

Persian Air Services, in which Skyways of London is believed to have an interest, operates freight services from Teheran to Beirut, Abadan, Kuwait, Brindisi and Basle.

Head Office: Teheran, Iran.
Fleet: Avro York.

Philippine Air Lines—PAL, began in 1932 as the Philippine Aerial Taxi Company. The company was reorganized and took its present name in 1941. Following the war the company developed its operations, and in 1947 and 1948 PAL took over two other Philippine concerns—Far Eastern Air Transport and Commercial Air Lines. Long distance overseas services were inaugurated to Europe and across the Pacific to the U.S.A., but in 1954 PAL abandoned its long distance services and now

Varig, one of Brazil's international operators, flies Lockheed Super Constellations on its route to New York. Brazil is second only to the U.S.A. in terms of passengers carried.

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operates only within the Philippine Republic and to Hong Kong.
Head Office: Manila, Republic of the Philippines.
Executives: A. Soriano, president; R. Yoga, vice-president/treasurer.
Fleet: 25 DC-3, one Convair 340, three Otter, two Hiller UH-12B. On order: two Viscount.
Results for year ended December 31, 1954: 258,439 passengers; 3,696,000 freight ton-km and 433,000 mail ton-km flown; total ton-km 15,680,000; 1,757 staff. Financial details not available.

Piedmont Airlines—see Piedmont Aviation, Inc.

Piedmont Aviation, Inc., was founded in 1940 as a fixed base operator and began local service operations in 1948. Trading as Piedmont Airlines the company now has about 2,800 miles of routes in North and South Carolina, Tennessee, Virginia and West Virginia, Kentucky and Ohio.
Head Office: Winston-Salem, North Carolina, U.S.A.
Executives: T. H. Davis, president/treasurer; R. D. Hager, vice-president traffic; H. K. Saunders, vice-president operations; M. F. Fare, Secretary.
Fleet: 17 DC-3. On order: 12 Friendship.
Results for year ended December 31, 1956: 405,153 passengers; 7,854,801 revenue ton-miles flown. Other details not available.

Pioneer Air Lines—see Continental Air Lines.

PLUNA—see Primeras Lineas Uruguayas de Navegacion Aerea.

Polskie Linie Lotnicze—LOT, was formed by the Government in 1929 to take over the operations of the private companies Aerolot and Aero of Poznan. By the start of the war LOT had established itself as a well run airline with a modern fleet of Electras and Lockheed 14s. Part of this fleet was brought to England and served with B.O.A.C. The airline flies domestic services and also to Athens, Belgrade, Berlin, Brussels, Bucharest, Budapest, Copenhagen, Moscow, Paris, Prague, Sofia, Stockholm, Vienna and Vilno.
Head Office: Warsaw, Poland.
Executives: S. Minorski, general director; M. Rolski, commercial director.
Fleet: Li-2, Il-14, Il-12.
Results for year ended December 31, 1955: 154,822 passengers; 666,000 freight ton-km and 398,000 mail ton-km flown; total ton-km 5,737,000; other details not available.

Primeras Lineas Uruguayas de Navegacion Aerea—PLUNA, began operations as a private company in 1936 but in 1943 it was reorganized, with the Government taking a 49 per cent interest. The Government share later rose to 83 per cent and subsequently 94 per cent, before becoming completely Government-owned in 1951. Pluna operates domestic services and routes to the Argentine, Bolivia, Brazil and Paraguay.
Head Office: Montevideo, Uruguay.
Executives: Col. E. B. Vaeza, president; D. D. Cibils, general manager; R. Langon, operations manager; M. Artagaveytia, traffic manager.
Fleet: six DC-3, four Heron. On order: two Viscount 770.
Traffic statistics not available.

Provincetown-Boston Airline operates feeder services between Provincetown Municipal Airport and Logan Airport, Boston, under the title "The Route of the Pilgrims."
Head Office: Provincetown, Mass., U.S.A.
Executives: J. C. van Arsdale, president/treasurer.
Fleet: Lockheed Electra and Cessna 190.
No traffic figures available.

"Q" Airways—see Aerovias "Q," S.A.

Qantas Empire Airways, Ltd., was founded in January 1934 by Q.A.N.T.A.S. and Imperial Airways for the operation of the Singapore - Brisbane section of the England - Australia air route then about to be established. Q.A.N.T.A.S. (Queensland and Northern Territory Aerial Services) was founded on November 16, 1920, and on November 2, 1922, the company opened its first service between Charleville and Cloncurry. This was the first air service in eastern Australia and it was operated by Armstrong Whitworth FK.8 biplanes. Qantas now operates a network of routes in the south-west Pacific and New Guinea areas; to Europe; to the Philippines, Hong Kong and Tokyo; across the Indian Ocean to South Africa; and, since taking over B.C.P.A. in 1954, a trans-Pacific route to Honolulu, San Francisco and Vancouver, British Columbia. This trans-Pacific route now connects with B.O.A.C.'s new London - San Francisco route to form a two-carrier all-Commonwealth round-the-world service.
Head Office: Sydney, N.S.W., Australia.
Executives: Sir Hudson Fysh, chairman; C. O. Turner, chief executive/general manager; Capt. G. U. Allan, asst. general manager; Capt. R. J. Ritchie, technical manager; C. W. Nielson, commercial manager; F. C. Derham, finance manager/secretary.
Fleet: 12 L.1049G, two L.1049H, five DC-4, eight DC-3, four Beaver, one Drover, two Catalina. On order: seven Boeing 707 (1959), two L.1049G (1957).
Results for year ended December 31, 1956: 129,618 passengers; 2,980,000 kg of freight and 1,446,000 kg of mail carried; 66,663,578 ton-miles flown; 5,867 staff. Financial details not available.

Quebecair, Inc., was incorporated in 1947 as Rimouski Airlines, Ltd., and took its present name in 1953. Services are operated across and on either side of the St. Lawrence from Quebec in the west to Port Menier and Schefferville in the east.
Head Office: Rimouski, P.Q., Canada.
Executives: A Dionne, president; C. Delisle, operations manager.
Fleet: two DC-4, six DC-3, three Canso, three Beaver, one Beech 18. On order: two Friendship (1958).
In 1953 the company carried 68,800 passengers and 670 tons of freight.

Queensland Airlines Pty., Ltd., was the name taken by Aircrafts Pty., Ltd., in 1947 when Butler Air Transport acquired control of the company by purchasing 93 per cent of the outstanding stock. Working under its separate identity, Queensland Airlines has a network of services in Queensland and south to Sydney, N.S.W. The company is now negotiating for Handley Page Heralds with Rolls-Royce Dart engines.
Head Office: Brisbane, Queensland, Australia.
Executives: R. S. Adair, managing director; D. C. McDonough, traffic manager; M. B. Mitchell, operations manager; A. Probert, chief engineer.
Fleet: three DC-3.
Results for year ended December 31, 1956: 57,252 passengers; 1,370,000 kg of freight and 15,850 kg of mail carried; 42 staff.

RANSA—see Rutas Aereas Nacionales, S.A.

REAL Aerovias Nacional is the new title adopted by Transportes Aereos REAL, S.A., since its recent take-over of National Transportes Aereos. REAL was originally founded in 1946 and by a series of mergers and acquisition of interest in other airlines the company is now the largest Brazilian airline. Coming under REAL's control earlier were Transportes Aerovias Brasil (Brazilian International Airlines) and Aeronorte. In addition to its Brazilian services REAL operates to the Argentine, Uruguay, Trinidad, Venezuela, Miami and Chicago. Unduplicated route mileage is believed to exceed 60,000 and the total staff numbers about 5,000.
Head Office: Sao Paulo, Brazil.
Executives: Not known since latest reorganization.
Fleet: 86 DC-3, eight Convair 440, six Con-

These red-and-white-painted de Havilland Beavers are used in New Guinea by Qantas Empire Airways. As in other places, the Beaver has proved valuable for outback duties.

vair 340, nine C-46, four DC-4. On order: three DC-7C, two Convair 440.

Reeve Aleutian Airways, Inc. This concern was founded in 1932 but operated mainly charter services until 1948 when the C.A.B. granted the company a certificate of public convenience and necessity. Services are operated from Anchorage through the Aleutians to Attu and the company is authorized to fly on an irregular basis between any of its certificated points and the Pribilof Islands.
Head Office: Anchorage, Alaska.
Executives: R. C. Reeve, president; Robert L. Hanson, vice-president; Margaret Rutledge, secretary; Janice M. Reeve, treasurer.
Fleet: three DC-3, two Sikorsky S-43, one Goose, two Fairchild 71, one Boeing 80A. On order: one DC-4.
Results for year ended December 31, 1956: 4,854 passengers; 203,940 kg of freight and 178,238 kg of mail carried; 649,737 ton-miles flown; total costs, £322,923; total revenue, £370,350; 56 staff.

Régie Aérienne Interinsulaire began services in 1951, linking points in the Society Islands, some of which were previously served by Air Tahiti and T.R.A.P.A.S. Points served, apart from Papeete in Tahiti, are Huahine, Raiatea and Bora Bora.
Head Office: Papeete, Tahiti.
Executives: Chief of the Service of Public Works and Mines; Agent of Messageries Maritimes.
Fleet: one Catalina.
Results for year ended December 31, 1956: 2,760 passengers; 12,123 kg of freight and 526 kg of mail carried; 74,001 ton-km flown; total revenue, £17,774; 12 staff.

Resort Airlines, Inc., is currently listed as a U.S. air carrier but no details are available on its present operations. The company is known to have operated on the U.S. Eastern seaboard and to Cuba, Bahamas and Haiti.
Head Office: Washington, D.C., U.S.A.
Executives: C. Davidson, jr., chairman; H. L. Graham, jr., president; J. P. Simpson, secretary.
Fleet: nine DC-4. On order, two L.1049H.

Riddle Airlines, Inc., is an all-cargo operator, serving the U.S. East Coast, the Mid-West and Puerto Rico. Cargo operations began between Puerto Rico and New York in 1947, and in 1951 the company became a certificated all-cargo carrier linking various cities in Puerto Rico via Miami. In 1955 Riddle was certificated to serve 13 additional cities in the U.S. The company also has a U.S.A.F. contract worth £3½ million to fly cargo between bases from Maine to Florida and as far west as Texas.
Head Office: Miami, Florida, U.S.A.
Executives: J. P. Riddle, president; Rodney W. King, executive vice-president; P. T. Craven, Snr. vice-president/treasurer; Jane B. Ramsey, secretary; C. L. Hood, vice-president traffic and sales; Jack Schopenhauer, vice-president maintenance.
Fleet: one DC-6A, four DC-4, 32 C-46. On order: four DC-6A (1957).
Results for year ended December 31, 1956: 19,127,412 kg of freight; 463,489 kg of mail and 640,273 kg of express; total ton-km flown (including charter), 39,076,360; total costs, £2,978,307; total revenue £2,763,878; 812 staff.

Royal Air Cambodge is a new company which began operations on November 1, 1956, and is flying services from Phnom-Penh to Kompongsom, Siem-Reap, Kratie, Stung-Treng, Savannakhet and Bangkok.
Head Office: Phnom-Penh, Cambodia.
Executives: Huot Sam Ath, chairman; Cyril Martin-Onraet, general manager.
Fleet: one DC-3, one Beaver.
Results for November and December, 1956: 1,984 passengers; 6,933 kg of freight and 374 kg of mail carried; 61,830 ton-km flown; 18 staff. Financial details not available.

Rutas Aereas Nacionales, S.A.—RANSA, was founded as a private company in 1948. The company has C.A.B. authorization to carry passengers, mail and cargo between Venezuela and Miami *via* Netherlands West Indies and Jamaica, but at present only cargo services are operated. Unduplicated route mileage 14,510.
Head Office: Caracas, Venezuela.
Executives: C. Chavez, president; E. Pardey, general manager; J. C. Cooper, traffic manager; R. D. Borges, operations manager.

One of Sabena's new fleet of 12 Convair CV-440 Metropolitans photographed at Brussels Airport. This aircraft is finished in the new Sabena livery, with all-blue fin and rudder.

Fleet: 13 C-46, three DC-3, five Cessna 180, one Cessna 170, two Beaver.
Traffic figures not available. 253 staff.

Rutas Aereas Sociedad Aeronautica Medellin, S.A., operates routes in the central and northern parts of Colombia serving Medellin, Bogota, Cali, Barronquilla, Santa Marta and other points.
Head Office: Medellin, Colombia.
Executives: Names not available.
Fleet: DC-4, DC-3.
Traffic statistics not available.

S.A. Empresa de Viação Aérea Rio Grandense, "VARIG," was founded in 1927, with the technical assistance of the German Condor Syndicate, for the operation of local services. The company now has an extensive route system in Brazil and also operates services to New York, Montevideo and Buenos Aires. In 1951 Varig took over Aero Geral, which was operating about 1,500 miles of domestic services. More than 80 per cent of Varig's capital is held by company employees, either privately or through the Foundation of Varig Employees. There is a small government holding.
Head Office: Porto Alegre, Brazil.
Executives: R. M. Berta, president; G. G. Herzfeldt, operations director; R. Schaly, director of traffic; H. Beaumel, director of maintenance; L. Zerwes, chief accountant.
Fleet: three L.1049G, five Convair 240, 14 Curtiss C-46, 23 DC-3. On order: two L.1049G (in place of two L.1649A).
Results for year ended December 31, 1955: 425,175 passengers; 18,607 tons of freight and 270 tons of mail carried; 35,348,000 revenue ton-km flown; total costs £10,705,882; total revenue £12,333,333; 3,159 staff.

Sabena Belgian World Airlines (Société Anonyme Belge d'Exploitation de la Navigation Aérienne) was founded in 1923 as successor to S.N.E.T.A. Sabena developed a European network and later routes to and in the Belgian Congo. The airline now has an extensive route-pattern in Europe, to the Middle East, to Africa, within the Belgian Congo and to North America.

Sabena is the only operator of international helicopter services. Following several years of helicopter mail operation within Belgium, the company began passenger services to Holland and France on September 1, 1953, and its S-58s now fly from Brussels to Lille, Antwerp, Rotterdam, Eindhoven, Liège, Maastricht, Cologne, Bonn, Paris, Luxembourg, Saarbrücken, Duisburg and Dortmund.
Head Office: Brussels, Belgium.
Executives: G. Périer, chairman; G. Claeys, managing director; W. Deswarte, general manager; G. Dieu, asst. general manager; A. Vernieuwe, senior vice-pres. operations; R. Golstein, general secretary; F. Pirson, senior vice-pres. technical.
Fleet: three DC-7C, eight DC-6B, three DC-6, two DC-6A, 12 Convair 440, four Convair 240, eight DC-4, 28 DC-3, eight S-58. On order: four Boeing 707-320 (1959), seven DC-7C, five Cessna 310.
Results for year ended December 31, 1956: 526,594 passengers; 27,780,341 freight and 6,176,628 mail ton-km flown; 109,495,963 total ton-km flown; 8,746 staff. Financial details not available.

Sadia S/A Transportes Aereos, is a new operator with scheduled services linking Sao Paulo and Joacaba, Florianopolis and Rio de Janeiro.

Head Office: Sao Paulo, Brazil, S. America.
Fleet: DC-3.
No other details available.

S.A.F.E.—see Braathens South American and Far East Airtransport A/S.

SAHSA—see Servicio Aereo de Honduras, S.A.

S.A.S.—see Scandinavian Airlines System.

Saskatchewan Government Airways was founded in 1947 by the provincial Government to take over the M. and C. Aviation Co. and to operate services to North Saskatchewan. The airline operates about 1,400 miles of routes northward from Prince Albert and serves places with such delightful names as Uranium City, Goldfields, Stony Rapids, Buffalo Narrows, Snake Lake, Pelican Narrows and Flin Flon. S.G.A. also leases aircraft to the Air Ambulance Service and the Forest Fire Control Branch of the Department of Natural Resources
Head Office: Prince Albert, Sask., Canada.
Executives: W. A. Houseman, chairman; Hon. A. G. Kuziak, minister; I. Macleod, general manager; F. R. Baudais, operations manager; J. A. Pool, chief engineer.
Fleet: one DC-3, four Norseman, one Otter, four Beaver, two Cessna 140, six Cessna 180, one Cessna 170, one Piper Super Cub.
Results for year ended December 31, 1956: 4,453 passengers; 2,816,040 kg of freight and 45,179 kg of mail carried; total costs, £294,136; total revenue, £315,026; 88 staff.

SATA—see Sociedade Açorianá de Transportes Aéreos, Ltda.

Saudi Arabian Airlines was founded in 1946 by the Government and is managed by T.W.A. The airline began operations in 1947 and now has about 4,500 miles of routes within Saudi Arabia and to Egypt, the Lebanon, Jordan, Sudan and Syria. Considerable pilgrim traffic is carried.
Head Office: Jedda, Saudi Arabia.
Executives: W. E. Blankenship, technical manager; S. H. Wheatley, supt. flight operations.
Fleet: Convair 340, DC-4, DC-3, Bristol 170, Sikorsky S-55.
Traffic statistics not available.

SAVAG—see Sociedade Anonima Viacao Aerea Gaucha.

Scandinavian Airlines System is a consortium of Swedish Air Lines (A.B.A.), Danish Air Lines (D.D.L.) and Norwegian Air Lines (D.N.L.) to the proportions 3, 2 and 2. S.A.S. originally came into being, in 1946, for the operation of transatlantic services, and both North and South Atlantic routes were opened in that year. All routes of the three airlines are now operated by S.A.S. with the original airlines acting as holding companies.

S.A.S. maintains Scandinavian internal services, a European network, and routes to South Africa, the Middle and Far East, and to North and South America. In 1954 a northern route between Scandinavia and the west coast of the U.S.A. was opened, and a trans-Polar route to the Far East was opened this year.
Head Office: Stockholm, Sweden.
Executives: H. Throne-Holst, president; S. Ostling, V. J. Rasmussen, T. A. Boye, N. Langhelle, executive vice-presidents; K. Hagerup-Svendsen, vice-president operations.
Fleet: 14 DC-7C (in course of delivery), 14 DC-6B, 12 DC-6, four DC-4, 11 Convair 440, 10 DC-3. On order: seven DC-8 (1960).
Results for year ended December 31, 1955:

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One of Tasman Empire Airways fleet of four Douglas DC-6s seen over the New Zealand Southern Alps. These aircraft maintain the services between New Zealand and Australia.

972,995 passengers; 10,970 tons of freight and 4,464 tons of mail carried; 127,591,000 revenue ton-km flown; total revenue, £21,984,550; 8,291 staff.

Scheduled Skyways System operates three services a day between Fayetteville and Little Rock.
Head Office: Fayetteville, Arkansas, U.S.A.
Fleet: Cessna 180.
No traffic figures available.

Seaboard and Western Airlines, Inc., is a well established scheduled cargo carrier. The company began operations in 1951 and on April 10, 1956, began scheduled North Atlantic operations between New York and Shannon, London, Glasgow, Brussels, Amsterdam, Hamburg, Cologne, Weisbaden, Düsseldorf, Frankfurt, Nuremburg, Stuttgart, Munich, Paris, Geneva and Zürich in Europe. Seaboard has interline agreements with many U.S. and foreign scheduled airlines. B.O.A.C. is general sales agent for Seaboard and Western in the United Kingdom.
Head Office: New York, U.S.A.
Executives: R. A. Norden, president; A. V. Norden, executive vice-president/treasurer; C. D. Brell, vice-president operations; W. P. Neth, vice-president traffic/secretary.
Fleet: 10 L-1049, four DC-4, one C-46.
Results for year ended December 31, 1956: 9,443,000 ton-miles flown on scheduled freight services; 57,000 passengers and 6,266,000 freight ton-miles flown on military contracts; operating costs, £6,407,807; operating revenue, £6,702,315; 857 staff.

Servicio Aereo de Honduras, S.A.—SAHSA, was founded in 1945 by Honduras private interests and Pan American Airways. Operations were begun in October 1945. The company operates a network of routes in Honduras and a route between San Pedro and Belize in British Honduras. In 1953 SAHSA acquired all the stock of TACA de Honduras but the latter concern continues to operate as a separate company.
Head Office: Tegucigalpa, Honduras.
Executives: R. Z. Romero, president/general manager; H. M. Posas, first vice-president; F. Lardizabal, treasurer; H. Maradiaga, secretary.
Fleet: seven DC-3.
Results for year ended December 31, 1956: 82,813 passengers; 4,722,102 kg of freight and 243,515 kg of mail carried; 82,763 ton-km flown; total costs, £403,909; total revenue, £436,291; 239 staff.

Serviço de Transportes Aéreos. Little is known about this company but it is believed to be operating regular services between the islands of Sao Tomé and Principe off the west coast of Africa.
Head Office: Sao Tomé, Province of Sao Tomé and Principe, Portuguese West Africa.
Executive: V. C. Cortes, chief executive.
Fleet: three D.H.89, one Tiger Moth, one Piper Super Cruiser, one Autocar.
Results for year ended December 31, 1956: 738 passengers; 3,375 kg of freight and 761 kg of mail carried; 10,075 ton-km flown; 26 staff. Other details not available.

Serviços Aéreos Cruzeiro do Sul Ltda—Cruzeiro. This airline's history goes back to December 1927 when Syndicato Condor Ltda was founded by German interests. A coastal route was established from Belem through Rio de Janeiro and on to Buenos Aires and across the Andes to Santiago in Chile. From Natal south this formed part of the German route to South America opened in 1934. Dornier Wal, Junkers F13 and W34s were used by Condor and later Ju 52s and Focke Wulf Condors came into service. In 1942 the company was reorganized, cleared of German control and given its present name. The company now operates more than 12,000 miles of routes in Brazil and between Brazil and neighbouring countries.
Head Office: Rio de Janeiro, Brazil.
Executives: Dr. J. B. R. Dantas, president; J. Q. V. de Carvalho, commercial director; Col. F. A. Rocha, operations director.
Fleet: 34 DC-3, four Convair 340, four Beech AT-11. On order: 10 Frye Safari.
Results for year ended December 31, 1955: 387,343 passengers; 7,740,000 freight ton-km and 331,000 mail ton-km flown; total revenue ton-km 28,800,000; 3,868 staff.
Financial details not available.

Slick Airways, Inc., is one of the largest U.S. scheduled cargo carriers. Its services include transcontinental operations from Boston and New York to Los Angeles and San Francisco, most flights serve Chicago. 33 cities are served. A very high percentage of the company's flying is done at night in order to provide overnight delivery services. Slick was founded in 1946 and began operation as a contract cargo carrier. Scheduled services were authorized in 1949.
Head Office: Dallas, Texas, U.S.A.
Executives: Robert J. Smith, president; John E. Muhlfield, vice-president sales and traffic; Henry P. Huff Jnr., vice-president operations and maintenance; Alwin Johnson, vice-president finance; Herman Ruppel, treasurer; John W. Walbert, secretary.
Fleet: eight DC-6A, eight DC-4, 13 C-46. On order: five DC-6A (1958).
Results for year ended December 31, 1956: 192,502,363 passenger-miles (on contract and international charter); 47,615,721 freight and 787,754 mail ton-miles flown; total ton-miles, 64,741,344; total costs, £7,802,780; total revenue, £7,938,072; 1,585 staff.

Sociedad de Transportes Aereos Ltda.— See Air Chile/Lyon Air.

Sociedade Açoriana de Transportes Aéreos, Ltda.—SATA. This company began operations in 1948 and now has 313 miles of routes. Nine services a week are operated between Sao Miguel and Santa Maria and three flights a week serve Terceira.
Head Office: Sao Miguel, Azores.
Executives: General managers: Bensaúde and Ca., Ltda.
Fleet: two Dove.
Results for year ended December 31, 1956: 7,321 passengers; 58,794 kg of freight and 48,471 kg of mail carried; 168,579 ton-km flown; 35 staff. Financial details not available.

Sociedade Anonima Viacao Aerea Gaucha—SAVAG. Founded in 1946 as a private company to operate services in the State of Rio Grande, the original fleet consisted of three Lodestars. Present routes are from Porto Alegre to Livramento; Rio Grande to Porto Alegre and Bage; and Sao Paulo to Bage. Cruzeiro do Sul supplies SAVAG with crews and provides maintenance, technical assistance and also handles reservations.
Head Office: Rio Grande do Sul, Brazil.
Executives: E. C. Becker, president; V. V. de Fonseca, vice-president; T. Fruet, operations manager.
Fleet: DC-3.
Traffic statistics not available.

Société Aérienne de Transport Guyane Antilles—SATGA (French Guiana Air Transport), flies local services in French Guiana. Cayenne, St. Laurent, St. Georges, Maripasoula and Saul are served by scheduled flights. Delice is served on request for cargo or ambulance calls.
Head Office: Cayenne, French Guiana.
Fleet: D.H.89, Vultee L-13.

Société Calédonienne de Transports Aériens "Transpac", operates services between Noumea and Isle of Pines, Lifu, Uvea and Maré.
Head Office: Noumea, New Caledonia.
Executives: H. G. Martinet, president; H. C. Coursin, manager; J. A. Lafargue, chief pilot; M. A. Couillaud, chief engineer.
Fleet: three D.H.89.
Results for year ended December 31, 1956: 5,886 passengers; 19,015 kg of freight and 4,386 kg of mail carried; 82,395 ton-km flown; total costs, £21,188; total revenue, £23,020; 16 staff.

South African Airways was formed in 1934 to take over Union Airways, and the airline is owned and controlled by the Government through the South African Railways and Harbours Administration. In 1935 the new airline acquired South West African Airways. SAA now operates an internal network of routes and also has services to Rhodesia and Europe. A new Johannesburg-London route *via* Leopoldville, Kano and Algiers was opened earlier this year.
Head Office: Johannesburg, Transvaal, Union of South Africa.
Executives: D. H. C. du Plessis, general manager; D. M. Robbertze, deputy general manager; J. G. Grové, asst. gen. man.; J. D. T. Louw, airways manager.
Fleet: three DC-7B, four L-749A, seven DC-4, six DC-3. On order: seven Viscount 813.
Results for year ended December 31, 1956: 267,288 passengers; 1,521,404 kg of freight; 1,339,404 kg of mail; 11,003,338 tonne-km flown; total costs, £S.A.6,744,940; total revenue, £S.A.7,593,228; 2,271 staff.

Southern Airlines, Ltd., was founded in April 1955 and operates services from Melbourne to Sale, Bairnsdale, Shepparton, Benalla, Warrnambool, Tocumwal, Kerang, Swan Hill, Flinders Island and Balranald. Free insurance is provided for all passengers with signed valid tickets.
Head Office: Melbourne, Victoria, Australia.
Fleet: Dove, Anson.

Southern Airways, Inc., was founded in July 1943 and began operations in June 1949. Twenty-eight cities are served in the states of Georgia, Alabama, Mississippi, Louisiana, Tennessee, Florida and North and South Carolina. Permanent certification was granted in May 1955.
Head Office: Birmingham, Alabama, U.S.A.
Executives: F. W. Hulse, president; C. M. Britt, vice-president sales; W. S. Magill, vice-president operations; G. Estey, secretary/treasurer.
Fleet: 13 DC-3.
Results for year ended December 31, 1956: 188,873 passengers; 591 kg of mail carried; 3,354,974 ton-miles flown; total costs £1,421,686; revenue £1,410,206; 482 staff.

South West Air Transport (Pty.), Ltd., has for several years been operating feeder services connecting with South African Airways' flights at Windhoek. The present operations include five weekly services between Windhoek and Otjiwarongo, Outjo, Tsumeb and Grootfontein and a twice weekly service between Windhoek and Walvis Bay.
Head Office: Windhoek, South West Africa.
Executives: P. H. M. Du Plessis, chairman; G. T. van Rooyen, manager; A. K. L. Finke, chief engineer.
Fleet: Ryan Navion, D.H.89.
Results for year ended December 31, 1955: 2,500 passengers carried; 11 staff. Other detail not available.

Southwest Airways Company was founded in 1941 and began airline operations at the end of 1946 when it opened its San Francisco-Los Angeles route. The company now has 1,300 miles of routes all within California, except for its services to Medford in the south of Oregon. Southwest was a pioneer of the quick turnround at intermediate points with stops of only one to two minutes. At refuelling stops the turn-round time is six minutes.
Head Office: San Francisco, Cal., U.S.A.
Executives: L. Hayward, chairman; J. H. Connelly, president; T. R. Mitchell, executive vice-president; A. W. Johnson, vice-president/treasurer; R. E. Costello, vice-president traffic and sales.

Fleet: ten DC-3, seven Martin 2-0-2, one Lockheed 12A for charter. On order: three Friendship.
Results for year ended December 31, 1956: 259,522 passengers; 1,104,396 kg of freight and 685,830 kg of mail carried; 5,909,876 ton-miles flown; total costs,* £1,452,676; total revenue,* £1,516,422; 417 staff.
* 1955 financial figures.

St. Vincent Government Air Service is believed to be operating services between St. Vincent and Barbados, Dominica, Grenada and Trinidad under charter to British Guiana Airways.
Fleet: Grumman Goose.
No other information available.

Sudan Airways is government-owned and began operations in 1947. Routes extend throughout the Sudan from Wadi Halfa in the north to Juba in the south; and from Geneina in the west to Port Sudan in the east. International routes serve Aden, Asmara and Cairo.
Head Office: Khartoum, Sudan.
Executives: A. B. Mohd, general manager; Y. Bakheit, traffic superintendent (admin.); M. H. A. Bashendi, traffic superintendent (technical); M. El Amir, sales superintendent; C. E. Blake, chief accountant; Capt. R. L. C. Branson, chief pilot; A. C. Watts, chief engineer; H. Ahmed, operations superintendent.
Fleet: five DC-3, four Dove.
Results for year ended December 31, 1955: 25,296 passengers; 380 tons of freight and 40 tons of mail carried; 1,302,697 ton-miles flown; 492 staff. Total costs (July 1954-June 1955) £466,083 approx.; total revenue (July 1954-June 1955), £453,554 approx.

Swissair—Swiss Air Transport Co., Ltd., was founded on March 26th, 1931, by the amalgamation of Ad Astra Aero A.G. and the Basle Air Traffic Co., known as Balair. Ad Astra was founded in 1919 and began flying-boat services linking Swiss cities, before pioneering international routes. Thus Swissair can claim, with its predecessors, 38 years of continuous operation, although its activities were severely restricted during the war. Since the war the company has grown rapidly and it now operates a network of European routes, and has services to North and South America and the Near East and Far East.

Swissair has always pioneered the use of modern equipment, first with Lockheed Orions and later with DC-2s and DC-3s. Continuing this tradition, Swissair has now placed an order for three DC-8s.
Head Office: Zürich, Switzerland.
Executives: Dr. W. Berchtold, president; E. Groh, vice-president finance; L. L. Ambord, vice-president traffic and sales; R. Fretz, vice-president operations; I. Lack, vice-president maintenance; A. Baltensweiler, vice-president planning.
Fleet: two DC-7C, six DC-6B, three DC-4, nine DC-3. On order: 11 Convair 440 (in course of delivery), two DC-7C (1957), three DC-8 (1960).
Results for year ended December 31, 1956: 773,956 passengers; 10,421,496 kg of freight and 3,608,345 kg of mail carried; 110,402,912 ton-km flown; total costs, £11,284,654; total revenue, £12,742,078; 3,881 staff.

Syrian Airways Company was formed in 1946 and began operations in 1947. Financial difficulties caused the suspension of services in 1948, but after receiving Government support operations were resumed in 1951. The company now flies domestic services and also has international routes to the Lebanon, Egypt, Saudi Arabia, Iraq and Kuwait.
Head Office: Damascus, Syria.
Executives: not known.
Fleet: DC-3, DC-4.
Traffic statistics not available.

T.A.A.—see Trans-Australia Airlines.

TABSO—Bulgarian Civil Air Transport, operates domestic services and routes to Belgrade, Budapest, Prague, Warsaw and Berlin. The airline came into being after the war as the Government's Bulgarske Vazdusne Sobstenie and in 1949 it became TABSO, in which Bulgaria and the U.S.S.R. each held 50 per cent. The U.S.S.R. withdrew its interest in 1954.
Head Office: Sofia, Bulgaria.
Fleet: Li-2, Il-14.

TACA de Honduras, now a subsidiary of SAHSA, began charter operations in 1931 and became part of the TACA System in 1932. Scheduled services were begun in 1944. The TACA System sold its interests in the company in 1948. The company operates a domestic network of services.
Head Office: Tegucigalpa, Honduras.
Executives: A. Rodriguez, president; W. A. Buxbaum, treasurer; C. A. Garcia, secretary.
Fleet: DC-3.
Traffic statistics not available.

TACA International Airlines S.A. was founded in Salvador in 1939 as a subsidiary of the U.S. TACA Corporation. Although TACA once controlled a number of airlines, TACA International is now the only one still operated by the Corporation. Routes extend from New Orleans and Mexico City through Guatemala, San Salvador, Tegucigalpa and Managua to San Jose, in Costa Rica, and Panama. A scheduled freight service is operated once a week between New Orleans and Guatemala. Route mileage is 3,980.
Head Office: New Orleans, Louisiana, U.S.A. (operating from San Salvador).
Executives: R. H. Kreite, president; R. E. Clipson, vice-president operations; J. D. Brook, vice-president traffic; W. B. Daly, treasurer; E. Canas, secretary.
Fleet: DC-4.
Traffic statistics not available. 148 staff.

T.A.E.—see National Greek Airlines (now Olympic Airways).

TAG Airlines, Inc., formerly known as Taxi Air Group began operation in April 1956 of a floatplane service linking downtown Detroit with downtown Cleveland. The company operates this service during the summer months but cannot use floatplanes off the lakes in winter; to overcome this problem and seasonal traffic drop the fleet is based on Miami during winter and services are operated to Fort Lauderdale, Boca Raton, Stuart, Key Largo and Marathon. The company also has rights for non-scheduled flights between the U.S.A. and Canada.
Head Office: Toledo, Ohio.
Executives: E. F. Knight, general manager; W. W. Knight, Jr., secretary/treasurer; E. A. Eklund, vice-president operations; W. J. Swann, vice-president sales.
Fleet: two Otter, one Beaver.
Results for year ended December 31, 1956: 3,100 passengers between Detroit and Cleveland and about 1,500 kg of freight carried on the same route; 14 staff. Other details not available.

T.A.I.—see Compagnie de Transports Aériens Intercontinentaux.

TAN Airlines—see Transportes Aereos Nacionales, S.A.

TAP—see Transportes Aéreos Portugueses.

TAROM—see Transporturi Aeriene Romine.

TAS—see Transportes Aereos Salvador, Ltda.

Tasman Empire Airways, Ltd., was formed in 1940 as a joint British - Australian - New Zealand company for the operation of services linking New Zealand and Australia. Operating Short C-class flying-boats, it maintained during the war the only regular passenger service of any kind between the two countries. In 1954 Britain withdrew and Teal is now owned jointly by the New Zealand and Australian Governments.

DC-6s replaced flying-boats on the trans-Tasman and Fiji services in 1954, but Solents are used on the Coral Route from Fiji to Tahiti *via* Samoa and Cook Islands, and between Fiji and Tonga. The company has 10,499 miles of routes in operation.
Head Office: Auckland, New Zealand.
Executives: Sir Leonard Isitt, chairman; G. N. Roberts, general manager; J. W. Veale, asst. general manager (commercial); F. A. Reeves, asst. general manager (technical); K. A. Brownjohn, operations manager; D. W. Banks, secretary; A. A. Watson, accountant.
Fleet: three DC-6; two Solent.
Results for year ended December 31, 1956: 54,036 passengers; 406,353 kg of freight and 364,601 kg of mail carried; 69,145,970 passenger-miles flown; total revenue, £1,906,408; 815 staff.

T.C.A.—see Trans-Canada Air Lines.

TEAL—see Tasman Empire Airways, Ltd.

Thai Airways Company, Ltd.—TAC, was formed in 1951 by the merger of Siamese Airways Co., Ltd., and Pacific Overseas Airlines (Siam), Ltd. The Government is believed to hold almost the entire stock. Thai Airways maintains domestic services and also operates to Calcutta, Rangoon, Hong Kong, Formosa, Tokyo, Vientiane, Saigon, Phnompenh, Siemreap, Penang and Singapore.
Head Office: Bangkok, Thailand.
Executives: Air Chief Marshal Luang Chert Vuddhakas, chairman; Sphrang Devahastin, chief executive; A.V-M. Luang Kora Kosyakarj, managing director overhaul base; Sakol Rasananda, managing director airline.
Fleet: two DC-4, five DC-3, two Norseman. On order: three L.1049G (1957).
Results for year ended December 31, 1956: 85,728 passengers; 768,172 kg of freight and 284,686 kg of mail carried; 6,383,539 ton-km flown; total costs, £1,146,563; total revenue, £1,068,336; 770 staff.

Trans-Air, Ltd., was formed recently by the amalgamation of Central Northern Airways and Arctic Wings. Central Northern Airways was formed in 1947 to acquire and operate some bush routes formerly operated, in Saskatchewan, Manitoba and Ontario, by Canadian Pacific Air Lines. Arctic Wings, based at Churchill on Hudson Bay, had been operating scheduled passenger and mail flights north to Baker Lake and south to Fort Severn. Charter flights and occasional mail services extended to the far north and served Arctic Bay and Pond Inlet on Baffin Island.
Head Office: Winnipeg, Manitoba, Canada.
Executives: M. E. Ashton, chairman; R. D. Turner, president; G. H. Sellers, vice-

Scandinavian Airlines System's Douglas DC-7C "Reidar Viking" at Anchorage, a stop on the new S.A.S. route from Scandinavia over the North Pole to Tokyo.

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president; F. C. McKay, secretary-treasurer.
Fleet: two Anson, three Beaver, one Bellanca 66-75, one Bristol 170, four Canso, four Cessna, one DC-3, one DC-4, one Lockheed 12A, 15 Norseman, one Waco YKC-S, one Waco AQC-8, one York.
Results for year ended December 31, 1956: 8,132 passengers; 439,397 kg of freight and 140,073 kg of mail carried; 57,844 freight ton-miles flown; total costs £1,366,785; total revenue, £1,425,357; 239 staff.

Transair Sweden A.B. Details of the company's present operations are not available, but in addition to charter flying and the operation of inclusive tours, Transair Sweden has operated scheduled services on behalf of S.A.S., including some between Stockholm and Visby.
Head Office: Stockholm, Sweden.
Executives: P. Loven, managing director.
Fleet: three DC-3, two Consul.
Results for year ended December 31, 1955: 27,375 passengers; 1,622 tons of freight and 2.5 tons of mail carried; 362,836 ton-km flown. Other figures not available.

Trans-Australia Airlines was set up, and is controlled on behalf of the State, by the Australian National Airlines Commission, for the operation of domestic services. Operations began in 1946 and have been extremely successful; its present route mileage of 32,228 makes it the largest domestic airline in the Commonwealth.

A network of routes link Melbourne, Adelaide, Sydney, Brisbane and Hobart. A coastal route serves Townsville and Cairns; there are routes from both Adelaide and Brisbane to Darwin and one from Adelaide to Perth. T.A.A. was the first Australian airline to operate Viscounts.
Head Office: Melbourne, Victoria, Australia.
Executives: W. D. McDonald, chairman; S. N. Crawford, secretary; J. P. Ryland, gen. mgr.; R. E. Bailey, dir., operations; J. Borthwick, commercial director; H. L. Brown, chief accountant.
Fleet: 11 Viscount, two Convair 240, four DC-4, 22 DC-3, four Drover, one Hiller UH-12C. On order: two Viscount (1958), six Friendship (1959).
Results for year ended December 31, 1956: 773,144 passengers; 18,454,717 kg of freight and 1,088,993 kg of mail carried; 10,984,338 ton-miles flown; total costs, £11,868,777; total revenue, £12,247,458; 3,687 staff. Financial results are for year ended June 30, 1956.

Trans-Canada Air Lines was founded in 1937 as the nationally-owned airline, with the stock being held by the Government Canadian National Railways. The company began operations between Vancouver and Seattle and established air mail services between Montreal and Vancouver by October 1938 and transcontinental passenger services by April 1939. In May 1947, T.C.A. took over commercial operation of its wartime-established transatlantic services to Britain.

The airline now operates transcontinental services, services to Europe, the U.S.A., Bermuda, Jamaica, the Bahamas and Trinidad. T.C.A. was the first airline to introduce Viscount services in North America.
Head Office: Montreal, Canada.
Executives: G. R. McGregor, president; H. W. Seagrim, vice-president operations; W. G. Wood, vice-president sales; R. H. Tarr, secretary; G. S. Cowie, treasurer.
Fleet: nine L-1049, 21 Canadair North Star, 18 Viscount, 24 DC-3. On order: two L-1049 (1957), 20 Viscount (in course of delivery), 20 Vanguard, four DC-8.
Results for year ended December 31, 1956: 2,072,912 passengers; 11,928,000 freight and 8,613,000 mail ton-miles flown; total ton-miles, 235,934,000; total costs, £29,366,264; total revenue, £32,609,302; 8,932 staff.

Trans-Caribbean Airways, Inc., operates weekend services, at low fares, between New York and San Juan, Puerto Rico.
Head Office: New York City, New York, U.S.A.
Executives: O. Roy Chalk, president; Irving M. Buckley, vice-president/treasurer; D. J. McFarland, director traffic and operations.
Fleet: DC-6, DC-4, C-46.
No other information available.

Trans-Eastern Airways, Inc., operates scheduled services from St. Petersburg to Tampa, Lakeland, Anna Maria, Holmes Beach, Sebring, Avon Park, Venice, Ft. Pierce, Punta Gorda, Ft. Lauderdale and Miami.
Head Office: St. Petersburg, Florida, U.S.A.
Executive: J. R. Topping, president.
Fleet: Beech 18, Grumman Widgeon, Cessna 120, Cessna 195, twin-engined Cessna.
No other details available.

Trans Island Airways, Ltd., was set up as a result of a meeting of Oamaru businessmen in February 1956 to decide on the provision of air services for North Otago, South Canterbury and Nelson. Licences were obtained for regular services between Christchurch and Timaru, Oamaru, Nelson, Rongotai, West Coast, and Chatham Islands. A licence has also been obtained for Rongotai-Chatham Is. services and for charter operations from both Christchurch and Oamaru. The first route to be opened, in April 1956, was Christchurch - Timaru - Oamaru operated with a D.H.89 and mail contracts were obtained for that route and also for the Christchurch - Nelson route.
Head Office: Oamaru, New Zealand.
Executives: K. T. Cusack, secretary; Brian G. Chadwick, chief pilot.
Fleet: one D.H.89, two Beech D.18S.

Trans Mar de Cortés was founded as a private company in 1947 and began operations in December 1948 with freight and mail services. Passenger carriage began in 1949 and in July 1952 the company took over Lineas Aereos del Pacifico. A network of routes is operated in the Gulf of California area.
Head Office: Guaymas, Sonora, Mexico.
Executives: M. Obregon, director/manager; L. Coppola, general manager; T. B. Lee, operations manager.
Fleet: three DC-3.
Results for year ended December 31, 1956: 27,321 passengers; 392,687 kg freight and 264,496 kg of mail carried; total costs, £2,360,000, total revenue, £2,430,000; 129 staff.

Transocean Air Lines, is a U.S. supplemental carrier operating a scheduled weekly service between Oakland and Okinawa *via* Honolulu, Wake Island and Guam. Other services are operated between Oakland, Burbank and Honolulu. Transocean is responsible for the Trust Territory Operations in the Pacific and also has interests in Air Jordan and Iranair.
Head Office: Oakland, California, U.S.A.
Executives: O. M. Nelson, president and chairman; S. A. Nichols, secretary/treasurer.
Fleet: DC-4.

Transocean Air Lines (Trust Territory Operations). The Trust Territory of the Pacific Islands includes the Carolines, the Marshall Islands and the Marianas. Some of the main islands in these groups were occupied under mandate by the Japanese until they were driven out during the war. The Trust Territory was then set up by United Nations with the U.S.A. as trustee. Transocean Air Lines was awarded a contract to provide air communication and emergency services in the area, and began passenger, mail and freight operations there in June 1951 with Cansos. Albatross amphibians now fly from Guam to Yap, Truk, Koror, Ponape and Majuro.
Head Office (Trust Territory Ops.): Guam, Marianas Islands.
Fleet: two Grumman Albatross, Canso.
Traffic statistics not available.

Trans-Pacific Airlines, Ltd. (TPA Aloha Airline), was founded in June 1946 and began non-scheduled passenger and cargo services on July 26 that year. A certificate for scheduled operation was applied for in 1946 and TPA worked as a common carrier until restrained in September 1947. The C.A.B. authorized scheduled services to eight cities on six islands in 1948, the President of the United States approved in February 1949 and regular scheduled services began in June 1949. TPA's routes are essentially similar to those operated by the long established Hawaiian Airlines.
Head Office: Honolulu, Hawaii.
Executives: R. F. Tongg, president; R. H. King, vice-president traffic and sales; O. V. Andrew, operations manager; D. A. Benz, executive vice-president; C. Young, treasurer.
Fleet: eight DC-3.
Results for year ended December 31, 1956: 206,624 passengers; 853,592 kg of freight and 94,498 kg of mail carried; 150,821 freight and mail ton-miles flown; total costs, £770,936; total revenue, £752,263; 238 staff.

Transportes Aereos Catarinense, S.A., operates coastal routes north from Florianopolis to Rio de Janeiro and south from Florianopolis to Porto Alegre and Bage. Cruzeiro do Sul provides TAC with crews and technical assistance.
Head Office: Florianopolis, Brazil.
Executives: Dr. J. D. F. Lima, president; L. F. Lima, vice-president/secretary; E. Neves, operations manager.
Fleet: DC-3.
Traffic statistics not available.

Transportes Aéreos da India Portuguesa is a recently formed company, which is operating services from Goa.
Head Office: Goa.
Executives: Maj. A. G. Solano d'Almeida, director.
Fleet: two Heron 2, two Viking.
Results for year ended December 31, 1956: 2,885 passengers; 6,157 kg of freight and 26,805 kg of mail carried; 3,681 ton-km flown; total costs, £93,576; total revenue, £51,275; 59 staff.

Transportes Aereos Nacionales, S.A.—TAN Airlines was founded by Honduran private interests in 1947 for the operation of contract cargo flights. The company built up substantial cargo traffic and in 1950 scheduled passenger and freight operations were begun. There is now a small U.S. private holding in the company. TAN's routes now serve Miami, Cuba, El Salvador, Guatemala, Nicaragua, Ecuador and Peru, in addition to Honduras. Unduplicated route mileage is 1,180.
Head Office: Tegucigalpa, Honduras.
Executives: M. Brooks, president; D. Caseo, secretary.
Fleet: DC-3, C-46.
Traffic statistics not available; 120 staff.

Transportes Aéreos Portugueses, S.A.R.L.—TAP, was organized in 1944 as a division of the Civil Aviation Department. Its first route between Lisbon and Madrid, was opened in September 1946. Services to Angola and Moçambique were opened in the following year. A large part of the stock of TAP is now privately owned. The company operates services between Lisbon and Oporto and international services to Tangier, Casablanca, Paris, Madrid, London, Luanda and Lourenço Marques. Schedules have been published for a new route from Lisbon to Recife and Rio de Janeiro.
Head Office: Lisbon, Portugal.
Executives: D. F. de Mello e Castro, chairman; E. Coelho, executive general secretary; H. Costa, commercial manager; R. de Avelar,

"Skyliner Baltimore" is one of T.W.A.'s considerable fleet of Martin 4-0-4s.

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operations superintendent; J. C. Ferreira, maintenance superintendent.
Fleet: six DC-3, three DC-4, three L-1049G.
Results for year ended December 31, 1956: 33,105 passengers; 123 tons of freight and 145 tons of mail carried; 5,109 942 ton-miles flown; total costs, £1,386,840; total revenue, £1,737,262; 669 staff.

Transportes Aereos Salvador, Ltda., was founded as a charter operator in 1949 and began scheduled operations within the State of Bahia in 1953. A network of local services is now being operated, although various difficulties brought about the suspension of operations during part of 1953. The company is believed to receive some State subsidy.
Head Office: Salvador, Bahia, Brazil.
Executives: C. P. Horta, general manager; J. F. P. Horta, technical manager.
Fleet: DC-3.
Traffic statistics not available.

Transportes Aéreos du Gabon, began regular operations in 1951 and now links a score of places with Libreville.
Head Office: Libreville, Gabon, Fr. Equatorial Africa.
Fleet: four D.H.89, four Cessna 170B, two Autocrat, one Proctor 5.
In 1953 the company carried 1,700 passengers.

Transporturi Aeriene Romine—TAROM (Rumanian Air Lines) is the Rumanian State airline which in 1954 succeeded the joint Soviet - Rumanian TARS, which was formed in 1946. TAROM has about 5,000 miles of routes and operates services within Rumania and to Budapest, Belgrade, Prague and Berlin.
Head Office: Bucharest, Rumania.
Executives: Ing. Stingaciu Vladimir, manager; Vaduva Gheorghe, asst. manager; Andrei Stefan, chief engineer.
Fleet: Li-2, Il-12, Il-14.
Traffic statistics not available but Tarom states that ton-km flown have risen by 300 per cent in the period 1946-56.

Trans-Texas Airways was founded in 1944 as Aviation Enterprises and began scheduled operation in October 1947. The airline now has about 3,000 miles of routes within Texas and between that state and Louisiana, Tennessee and Arkansas.
Head Office: Houston, Texas, U.S.A.
Executives: R. E. McKaughan, president; H. E. Eromann, vice-president operations; L. J. Eichner, vice-president traffic and sales; M. L. Muse, secretary/treasurer.
Fleet: 20 DC-3.
Results for year ended December 31, 1956: 219,500 passengers; 346,000 freight and 161.700 mail ton-miles flown: total ton-miles, 5,260,700: total costs, £2,123,214; total revenue, £2,135,000; 867 staff.

Trans World Airlines, Inc., claims its origin in Western Air Express, which was founded in 1925 to bid for an air mail route from Los Angeles to Salt Lake City. WAE began mail service in 1926. In 1929 Transcontinental Air Transport, which had inaugurated a combined rail-air transcontinental route, obtained control of Maddux Air Lines. At about the same time Western Air Express absorbed Standard Air Lines and then on October 1st, 1930, TAT-Maddux and Western Air Express completed a merger to form Transcontinental and Western Air, Inc. (TWA). In 1934, reconstitution followed the Post Office mail-flying upheaval, and it took its present title in 1950. TWA has been responsible for the production of some fine aircraft, having issued the specification for the Douglas DC-1/DC-2, the Stratoliner and the Constellation. TWA now has more than 35,000 miles of routes stretching from coast-to-coast of the U.S.A.; across the North Atlantic to Europe, North Africa and Asia. The company is now certificated to serve Manila and expects to open this extension during 1957.
Head Office: New York, N.Y., U.S.A.
Executives: Warren Lee Pierson, chairman; Carter L. Burgess, president; A. V. Leslie, senior vice-president finance; E. O. Cocke, senior vice-president sales.
Fleet: 28 L-1049G, nine L-1049A, 71 Constellation, 10 DC-4, five DC-3, 11 Martin 2-0-2, 37 Martin 4-0-4, one Fairchild C-82. On order: 25 L-1649A (in process of delivery), 30 Convair 880 (1960), eight Boeing 707 (1959).
Results for year ended December 31, 1956: 4,428,140 passengers; 38,814,226 kg of freight carried; 23,869,000 mail ton-miles flown; 451,780,000 total revenue ton-miles flown; total costs, £87,330.357; total revenue, £85,855,000; 19,945 staff.

A Nord Noratlas in the service of U.A.T. This example is seen without the wing-tip-mounted Turboméca auxiliary gas-turbines.

Trust Territory Operations—see Transocean Air Lines. (Trust Territory Operations.)

Tunis Air, Société Tunisienne de l'Air, was founded in 1948 by the Tunisian Government, Air France and other interests. It operates internal services and routes to Algeria, Libya, Corsica, France and Italy.
Head Office: Tunis, Tunisia.
Executives: P. F. Delaunay, general manager; G. Sartre, commercial manager; M. Gauthier, technical manager.
Fleet: two DC-4, three DC-3.
Results for year ended December 31, 1955: 92,344 passengers; 498 tons of freight and 189 tons of mail carried; 4,829,927 ton-km flown; total costs, £550,000; total revenue, £620,000; 140 staff.

Türk Hava Yollari Anonim Ortakligi, formerly known as Devlet Hava Yollari (Turkish State Air Lines) was set up by the Government in 1933 as part of the Turkish Air Force. Control passed to the Ministry of Communications in 1939. Operations were confined to domestic services until 1949. The airline now operates an internal network of passenger services and a freight service between Istanbul and Ankara. International routes are to Nicosia and Beirut. T.H.Y. has recently become a member of I.A.T.A. There is to be close co-operation between B.O.A.C. and T.H.Y.
Head Office: Ankara, Turkey.
Executives: H. Unsal, general manager; H. Yegin, technical director; S. Iscen, operations director; T. Sayar, accounts director; C. Ozcivelek, commercial director.
Fleet: 21 DC-3, seven Heron.
Results for year ended December 31, 1955: 178.221 passengers; 3,034 tons of freight and 1,129 tons of mail carried; 6,410,159 ton-km flown: total costs, £1.126,666; total revenue, £1,403,205; 1,186 staff.

U.A.T.—see Union Aéromaritime de Transport.

Ukamps, the North Korean airline, is successor to Sokao, the Soviet-North Korean airline, which was founded in 1950 to connect North Korea with Aeroflot's services to and from Moscow. Services were suspended when North Korea invaded South Korea and operations were resumed in 1953.
Ukamps, described as Ministry of Communications of Korean Democratic People's Republic, now operates between Pyongyang and Mukden, and as part of the Aeroflot Moscow route between Pyongyang and Chita.
Head Office: Pyongyang, Korean Democratic Republic.
Fleet: Li-2.

UMCA—see Uraba, Medellin and Central Airways, Inc.

Union Aéromaritime de Transport (U.A.T./Aéromaritime) was founded in 1949 and is connected with Cie. Maritime des Chargeurs Réunis. Services were opened to French Equatorial Africa and to Saigon. Comets were introduced on the African routes in 1953. Since January 1, 1955, U.A.T. has had the rights for the operation of all French services to Rhodesia, Mozambique and the Union of South Africa, and the company is operating between Paris and Johannesburg. U.A.T. also has 46 per cent of the traffic over the coastal routes from France and North Africa to Senegal, French Guinea and the Ivory Coast. In Afrique Noire there is to be equal distribution of traffic between U.A.T. and Air France.
A U.A.T. subsidiary Aéromaritime, operates a network of feeder services in West Africa.
Head Office: Le Bourget, nr. Paris, France.
Executives: L. Vidal, president; J. Combard and R. Loubry, directors.
Fleet: seven DC-6A/B, two DC-4, eight Heron, four Noratlas. On order: two DC-6B (1958), three DC-8 (1960), option on two DC-8 (1960).
Results for year ended December 31, 1956: 124,720 passengers; 8,687,769 kg of freight and 530,018 kg of mail carried; 16,351,712 ton-km flown; 1,494 staff. Financial details not available.

Union of Burma Airways was organized in 1948 with the Burmese Government subscribing 90 per cent of the capital. UBA operates domestic services and has international routes to Calcutta, East Pakistan, Thailand, Penang and Singapore.
Head Office: Rangoon, Burma.
Executives: U. Chit, chairman; U. Taw, general manager; B. G. Jones, engineering superintendent.
Fleet: nine DC-3, three Dove, two Marathon, one Convair PBY-5A. On order: three Viscount 761.
Traffic statistics not available.

United Air Lines, Inc., was organized on July 1, 1931, as a management company for Boeing Air Transport, Pacific Air Transport, National Air Transport and Varney Air Lines. These companies enable United to claim continuous operation back to 1926 when Varney began service. In 1933 United pioneered the use of the low-wing twin-engined metal monoplane when it introduced Boeing 247s on its coast to coast route, cutting the journey time to 19½ hr. U.A.L. Inc., became an operating company in its own right on May 1, 1934, following the Post Office mail contract fiasco.
In 1947 United opened a route from San Francisco to Honolulu and the company's present network extends from coast to coast over a number of routes. Hawaii is served from both San Francisco and Los Angeles. There are 13 nonstop flights a day between New York and Chicago and UAL has an extensive west coast system. Its DC-7s fly from New York to Los Angeles nonstop in 9 hr.
Head Office: Chicago, Illinois, U.S.A.
Executives: W. A. Patterson, president; R. E. Johnson, asst. to president; J. A. Herlihy, vice-president engineering and maintenance; D. R. Petty, vice-president flight operations; C. Barkes, vice-president finance and property; R. W. Ireland, vice-president traffic administration; S. P. Martin, secretary; A. M. de Vournsey. treasurer.
Fleet: 32 DC-7, 30 DC-6B, 42 DC-6, 55 Convair 340. five DC-6A. On order: 24 DC-7 and 11 DC-6B (1957/58), 30 DC-8 (1959).
Results for year ended December 31, 1956: 6,266,000 passengers; 106,685,000 kg of freight and mail carried; total costs, £85,208,580; total revenue, £93,853,792; 19,394 staff.

Uraba, Medellin and Central Airways, Inc.—UMCA operates Convair 240s thrice weekly between Balbao and Medellin. UMCA was

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founded in 1931, as a Pan American World Airways' subsidiary and operates its services with aircraft leased from P.A.W.A.
Head Office: Medellin, Colombia.
Executives: E. Ballader, president; R. G. Ferguson, treasurer; J. A. Mannion, secretary.
Fleet: Convair 240 leased from P.A.W.A.
Traffic statistics not available.

VARIG—see S.A. Empresa de Viação Aérea Rio Grandense.

VASP—see Viaçao Aerea Sao Paulo, S.A.

Vestlandske Luftfartselskap A/S. (West-Norway Airlines) was founded, mainly by Bergen shipping interests, as a private company in 1947. Considerable charter work and ambulance flying is done, and since 1951 V.L.S. has operated scheduled flying-boat services over two routes, Bergen-Alesund-Molde-Kristiansund-Trondheim in summer and Bergen-Haugesund-Stavanger throughout the year.
In June 1956 V.L.S. opened a landplane route Stavanger-Bergen-Trondheim and this route is flown throughout the year. This summer Floroe is to be served as a call on the Bergen-Trondheim flying-boat route.
Head Office: Bergen, Norway.
Executives: S. Liby, managing director; A. Wagner Larsen, chief engineer; R. F. Rasmussen, chief pilot.
Fleet: one Heron 2, two Sealand, two Seabee.
Results for year ended December 31, 1956: 11,141 passengers; 5,623 kg of freight and 40,500 kg of mail carried; 216,467 ton-km flown; 25 staff. Financial details of the year's operations are not available.

Viacao Aerea Sao Paulo, S.A.—VASP, was founded in 1934 and began scheduled operations in 1935. Most of the company's stock is held by the Sao Paulo city, State and Municipal Bank. The company operates over more than 4,500 miles of domestic routes, and has no less than 60 flights a week in each direction between Sao Paulo and Rio de Janeiro. The airline flies both 2nd and 3rd class services.
Head Office: Sao Paulo, Brazil.
Executives: J. V. de Faria Lima, president; J. Castilho Cabral, vice-president; O. P. Pinto, director/executive.
Fleet: 15 DC-3, 9 Scandia, one Beechcraft. Reported to be taking delivery of S.A.S.'s fleet of Scandias.
In 1954 VASP carried more than 250,000 passengers and flew more than 5,500,000 revenue ton-miles; 1,030 staff.

West African Airways Corporation, an associate of B.O.A.C., was founded in 1946 by the West African territories of Nigeria, Gold Coast (now Ghana), Sierra Leone and the Gambia. Most of the company's network is in Nigeria but services extend as far west as Dakar and the unduplicated route mileage is about 7,000. The Corporation developed extensive second-class services with its former fleet of Bristol 170s and, in fact, passengers on some routes are predominantly African.
Head Office: Lagos, Nigeria.
Executives: R. W. C. Baker-Beall, chairman; D. Malcolm Brown, general manager; R. R. R. Allen, chief engineer; A. A. Cooper, secretary/chief accountant; Capt. A. L. Greenacre, chief pilot; J. P. S. Bailey, traffic manager.
Fleet: eight Heron, two Dove, two Bristol 170.
Results for year ended December 31, 1956: 52,327 passengers; 1,668,372 ton-miles flown; total operating costs, £1,085,119; total traffic revenue, £886,363; 1,090 staff.

West Coast Airlines, Inc., was founded in 1941 under the laws of the State of Washington for the operation of passenger, mail and express services in the Pacific Coast area, but the C.A.B. held the application over until after the war and only granted certificates in 1946. The company took over Empire Air Lines in 1952 and now operates 2,000 miles of routes in Washington, Oregon and Idaho.
Head Office: Seattle, Washington, U.S.A.
Executives: N. Bez, president; G. Hamilton Beasley, executive vice-president; R. A. Duwe, secretary/treasurer; E. B. Code, vice-president operations; T. Croson, vice-president sales.
Fleet: 14 DC-3. On order: four Friendship (November 1957).
Results for year ended December 31, 1956: 210,729 passengers; 90,779 freight ton-miles and 47,240 mail ton-miles flown; 3,323,249 total ton-miles flown; total costs, £1,382,076, total revenue, £1,428,936; 413 staff.

"Mainliner Walla Walla," seen above at San Francisco, is one of 55 Convair CV-340s operated by United Air Lines. The U.A.L. DC-6B, the tail of which appears on the left, bears the new colour scheme designed for the airlines' DC-8s. (Below) West Norway Airlines' de Havilland Heron 2 flies between Stavanger and Bergen and Trondheim.

West Coast Airways, is a new operator flying scheduled services between Hokitika and Franz Josef Glacier, Fox Glacier, Haast and Milford Sound. The Haast - Milford Sound sector is only operated on request.
Head Office: Hokitika, New Zealand.
Fleet: D.H.89.
Other details are not known.

Western Airlines, Inc, claims to be the United States' oldest airline, having been founded in 1925 as Western Air Express. On April 17, 1926, air mail services were begun between Los Angeles and Las Vegas and Salt Lake City and on May 23 that year the first passengers were carried over the route. Western Air Express was part of the original TWA when it was formed in 1930 but Western regained its independence in 1934. The present name was legally adopted on March 11, 1941. WAL now operates 6,350 miles of routes in the Western and mid-West states. One route extends across the Canadian border to Edmonton.
Head Office: Los Angeles, Cal., U.S.A.
Executives: T. C. Drinkwater, president; P. E. Sullivan, vice-president/secretary; J. J. Taylor, vice-president/treasurer; S. R. Shatto, vice-president operations; M. W. Landes, vice-president-service.
Fleet: 12 DC-6B, nine Convair 240, three DC-4, seven DC-3. On order: nine Electra (1959/60).
Results for year ended December 31, 1956: 928,746 passengers; 48,480,929 revenue ton-miles flown. Other details not available.

Wheeler Airlines, Ltd., is Canada's oldest airline, having been founded in 1921. The company is mostly engaged in non-scheduled operations but maintains a Beech-18-operated service on weekdays between St. Jovite and Montreal.
Head Office: St. Jovite, P.Q., Canada.
Executives: F. H. Wheeler, president; R. Rychlicki, general manager; J. Bancroft, treasurer; G. Fitzgerald, secretary.
Fleet: Includes DC-4, C-46, Canso, Norseman, Beaver, Anson 5, Cessna 180 and 195, Boeing 75 (for crop spraying).
Traffic statistics not available.

Widerøe's Flyveselskap og Polarfly A/S. is an old-established company engaging in many forms of air activity including charter flying and air survey. Widerøe's operated various pioneer air services around the Norwegian coast before the war, and for several years since the war the company has been operating the north Norway services for S.A.S. Routes, flown in summer, are Bodö - Tromsö, Bodö - Narvik, Tromsö - Andsvann and Tromsö - Vadsö.
Head Office: Oslo, Norway.
Executive: V. Widerøe, general manager.
Fleet: two Otter and four Norseman on scheduled services and two Lockheed 12A, two Seabee, one Cessna 170, one piper Cub. On order: two Otter (1957).
Results for year ended December 31, 1956: 11,640 passengers; 16,998 kg of freight and 102,886 kg of mail carried; 229,350 ton-km flown; total costs, £125,000; total revenue, £150,000; 60 staff.

Wien Alaska Airlines, Inc., operates an extensive network of passenger, freight and mail services throughout most of Alaska. Operations are concentrated in the Fairbanks area with longer routes stretching to Nome in the west and Point Barrow on the north coast. The company has operated under its present title since 1936. Previously it had operated since 1929 as Northern Air Transport; its original operations began in 1924.
Head Office: Fairbanks, Alaska.
Executives: S. Wien, president; G. B. Rayburn, executive vice-president and treasurer; F. Wien, vice-president operations; A. E. Hagberg, vice-president traffic; R. M. King, secretary.
Fleet: five Curtiss C-46, three DC-3, five Norseman, 12 Cessna (types 170, 180, 195).
Results for year ended December 31, 1956: 20,866 passengers; 1,446,885 kg of freight carried; 1,776,977 ton-miles flown; total costs, £1,947,479; total revenue, £1,777,508; 279 staff.

Woods Airways Pty., Ltd., was founded in 1947 and began scheduled operations in July 1948. The company's only route is that between Perth and Rottnest Island—a distance of 26 miles. Twelve services are flown in each direction every week and extra services are operated on demand.
Head Office: Perth, W. Australia.
Executives: Capt. J. Wood, managing director; G. L. S. Williams, secretary.
Fleet: two Avro Anson.
Results for quarter ended September 30, 1955: 651 passengers; 999 kg of freight and 9 kg of mail carried; freight and mail ton-miles performed, 57. No other details available.